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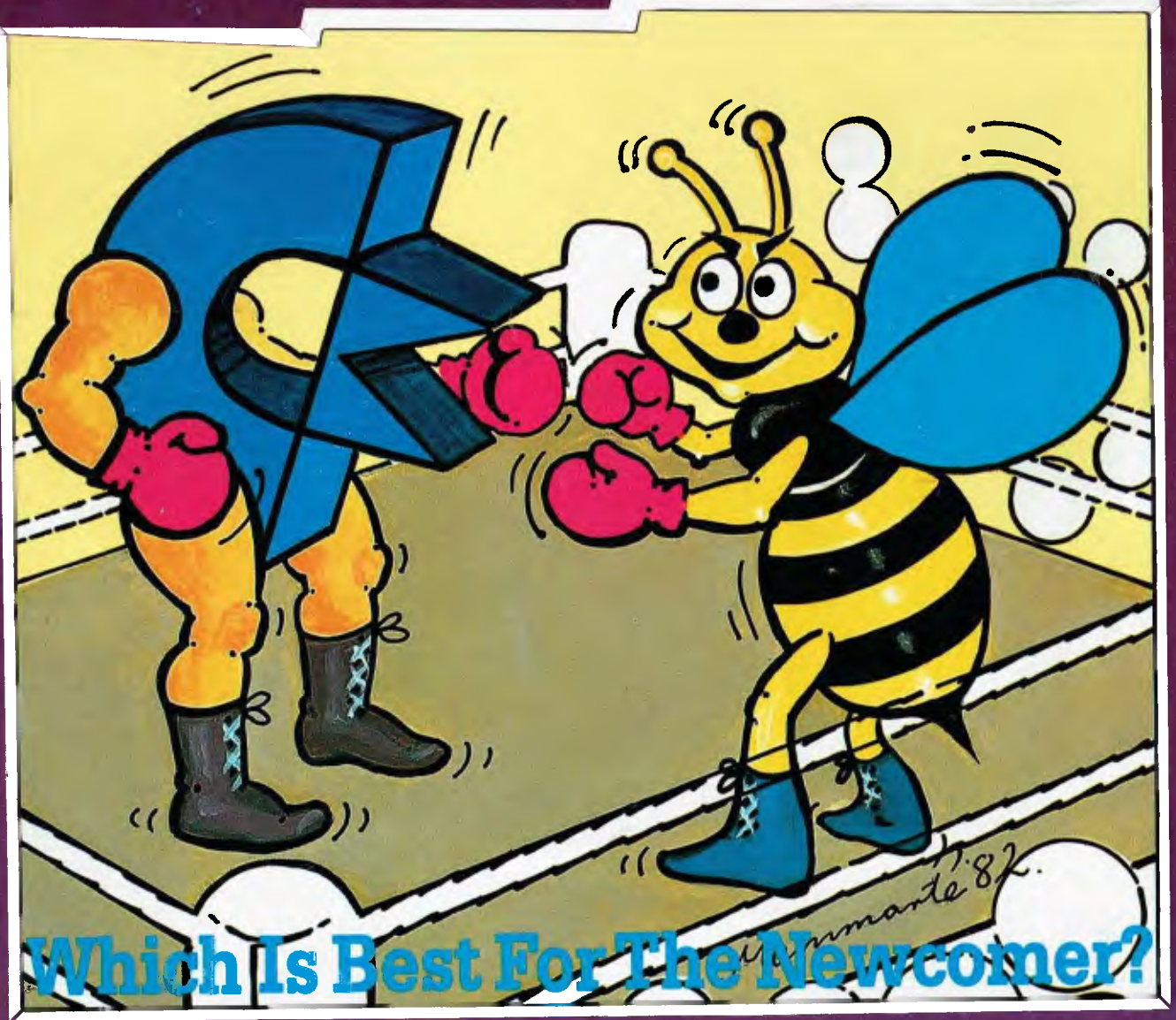

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REVIEWS: APPLE III, VECTOR, IMS • PRINTERS •WE TRY PANASONIC'S IBM • MORE POCKET PROGRAMS • OWNER REPORTS • TUTORIALS – BASIC AND ASSEMBLER

ISSN 0725-391

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inside your computer

Vol 2, No 1. July 1982.

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Popular Systems
In fact, they're becoming too popular — we couldn't fit some in again this month! At least Atari made it back in this time, after being squeezed out of the last issue. We'll be introducing some new columns soon, too — watch this space...

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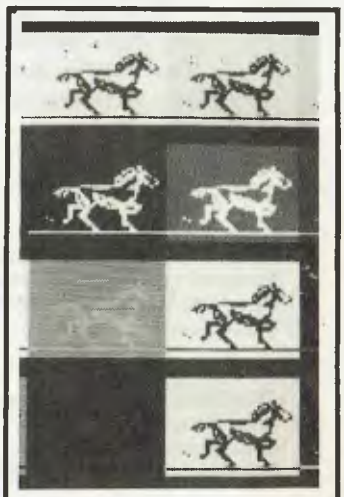
Readers' Services
Want to contribute a story, write a program, ask a question, subscribe, sue us or . . . ? Read this first.

In answer to all your questions, we look at entry-level computing — do you start with a ready-to-roll consumer special, or go for do-it-yourself power? Find out on page 20.

We've had a closer look at the Panasonic JB3000, supposedly a fully software-compatible 'brother' to the IBM PC. Page 34.



Galloping guru Les Bell puts some more business machines through their paces on page 25 — starting with the Apple III.

editorial

I won't be popular for what I have to say here, but it really is time to bite the bullet and comment on something I feel is important to our readers — especially the newcomers.

Prospective and current computer owners and users rely heavily on newspapers and magazines for information on products and techniques which will make their systems operate more smoothly and efficiently. The computer press therefore has an important part to play in the dissemination of information from the manufacturers and software houses to the users.

Why, then, is computer journalism generally treated as an outgrowth of financial or general reporting, when users are increasingly in need of solid technical information? The results are so often confusing, misleading or just plain wrong.

Let me give you an example: most writers have not yet realised that there are two distinct CP/M operating systems: CP/M-80, the older version for 8080-, 8085- and Z-80-based computers, and CP/M-86, which runs on the Intel 8086 and 8088 processors. Although there are similarities in style of design and operation, the two are fundamentally different.

The result has been confusion on the part of many readers, who have mistakenly believed that software written for CP/M-80 will run under the CP/M-86 operating system. It cannot: the two operating systems run on completely different machines. Software cannot be transported between the two without some extensive, and quite tricky, rewrites.

I could point to many other examples: confusion of gigabytes with megabytes in describing mass storage; reviews of products that will never be released on the Australian market; and uncritical repetition of manufacturers' claims — claims which would often cause even the comparative neophyte to raise his eyebrows quizzically.

The basic problem, dare I say it, is the simple lack of computing expertise amongst the computer press. Of all the computer writers in Sydney, only one — outside this magazine — actually owns and uses a computer. In two offices we have four computers. We call that 'putting your money where your mouth is'.

Technology may well be difficult to understand, and it is tempting to avoid the jargon, but when it comes to the crunch, a computer is a complex piece of equipment, and a well-informed owner/user is much farther ahead of the game. With a little reading, it is possible for a user to be more aware than his equipment supplier, avoiding the trap of being 'locked in' to one source of software — perhaps the most common pitfall for the novice.

The computer press has a responsibility to provide the user with technically accurate, comprehensive information on which to base well-informed business and personal decisions. Only in Australia is the trend towards a less technical and 'de-jargonised' computer press. In the US and UK, writers and users are getting down to nuts and bolts with a resultant healthy attitude towards the adoption of new technology.

One user has stated 'Don't buy a computer unless you are willing to learn enough about computer hardware and software to fix minor problems yourself'. I could paraphrase that to 'Don't write about computers unless you have learned enough about computer hardware and software to fix...' or perhaps more to the point, 'Don't write about computers until you've bought one'. □

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your computer news

Modem Breakthrough

DICK SMITH Electronics is about to release a modem which will turn the market upside down, and open up the world of electronic communications to a lot more people.

The Australian designed and manufactured unit is the country's first fully approved discrete direct-connect modem — and it will sell for a staggering $169!

It will be available in Dick Smith stores within six weeks.

The unit, designed by former Electronics Australia editor Jamieson Rowe (now DSE technical director), has Telecom approval and complies with CCITT recommendation V.21 — which simply means it's both legal, and compatible with modems in current use.

Owners may have to pay a further cost for Telecom installation — an extra plug — but even so it dramatically reduces the price of communications. Currently, computer users have only a choice between a $500-plus (annually) rented modem from Telecom and acoustic couplers at up to $400.

The Dataphone, as the new modem is called, should provide far superior performance to the coupler method at much lower cost. It is a true full-duplex 300 baud direct-connect unit. Connection is standard RS-232C, it has switch selection for answer/originate and voice/data, there is a carrier-detect indicator, and it comes with an approved power supply and manual.

Oops...Someone Slipped

YOU can't win them all, as we keep telling ourselves while we're waiting to win one...

Last month we carried a review of Imagineering's Digitek PAL colour card for the Apple, in which we had a general rave about the brilliant low prices of the Digitek range.

Only problem is, the prices we used were all wrong!

While the sentiments expressed — we were glad to see some quality inexpensive peripherals for the Apple — still stand when you compare the Digitek boards to others sold here, the exact figures don't.

These are the real prices (which still represent good value): Z80 card $255, 16K add-on RAM $179, parallel interface with graphics $180, serial interface $180, PAL card (with RF modulator) $215.

Software Sales Tax

SENATOR John Siddons has called on the Treasurer to consider exempting computer software from sales tax.

Senator Siddons, the Australian Democrats' spokesperson on the Treasury, said the industry uses Australia's technological skills, is labour intensive and that Australia is rapidly acquiring a high international reputation for the quality of its computer software.

Questioning the Government's Senate spokeswoman on the Treasury, Senator Dame Margaret Gilfoyle, Senator Siddons said that for many years the Government has classified software as a service and not a good.

"In this way the Government was able to discriminate against the software industry, refusing it research and development grants, grants-in-aid and tax incentives," he said.

"But recently the Government seems to have decided software has suddenly be come a good and thus should be liable to sales tax.

"But recent indications are, that on the contrary, the Government might seek sales tax retrospectively for the last three years. There is clear evidence that the Taxation Office has consistently informed many companies over a period of years that sales tax was not payable. My inquiries have revealed

Fairlights For Japan

SYDNEY'S Fairlight Instruments has announced the signing of a marketing agreement for its Computer Musical Instrument (CMI) with a major Japanese company.

The agreement, initially worth $250,000, is with the giant Matsushita Electric Company which manufactures brands such as National Panasonic, Technics and JVC.

According to a Fairlight spokesman, the deal represents the first sale of Australian designed and manufactured microcomputer-based systems with specialised peripherals and software to that country. The CMI uses four Motorola microprocessors in its architecture.

Fairlight's CMI is recognised as a world leadeyJ9 the field of electronic musical instruments. The dual microprocessor CPU and waveform manipulation techniques were developed after initial work by Creative Strategies.

Current users of the system include Stevie Wonder, Barry Gibb, Paul McCartney, Led Zeppelin, Herbert Von Karajan (Berlin Philharmonic Orchestra), Fleetwood Mac, Kraftwerk and Yes.

Total export sales since the system was launched eighteen months ago have now reached $2 million in end-user value.

For further information contact Fairlight Instruments at 15 Boundary Street, Rushcutters Bay, 2011. Telephone (02) 331 6333.

that as early as 1979 at least one Taxation Office had changed its mind, but that fact was not made widely known.

"It is incredible — and grossly unfair — that taxpayers in one part of Australia should be paying a tax when taxpayers elsewhere are not. Yet companies which were not paying the sales tax on software had their books checked by officers of the Taxation Office and passed as totally valid.

"The new interpretation can thus be viewed as a new tax imposed without the consent of Parliament, without public debate, without more than an administrative appeal and furthermore, with provision for three years retrospectively." he said.

Senator Siddons also criticised recently issued guidelines on the subject from the Taxation Office. These, he said, reflected the unfamiliarity of the Taxation Office with the issue and the practice of the software business.

"Sales Tax on software is a tax on knowledge and we will fight it in every way we can." he said. □

Sinclair Software

AXIOM Software has announced the release of several new products for the ZX81 owner. The first is a book, The ZX81 Pocket Book, which contains many examples of programming using ZX81 BASIC.

Areas such as memory reduction, efficiency considerations, string techniques and simple machine code are covered. There are useful subroutines and programs both for the 1K and for the 16K machines.

One of the most interesting programs is one to play an Adventure style game. This game is run by an 'adventure interpreter' and it is explained how to set up your own adventure.

Along with the book is a companion tape, The ZX81 Pocket Book Tape. This is priced separately and contains all of the code in the book, plus some extra programs.

ZX81 Adventure 1 is a tape containing three separate adventures all based on the format used in the pocket book. The games are Greedy Gulch, Pharoah's Tomb and Magic Mountain. They range from puzzling through to very hard, but there is an instruction program on the tape so you aren't left in the dark totally.

For further information contact Axiom Software at PO Box 168, Carlton 3053. □

Media Storage Units

TWINLOCK Australia has launched a range of storage units for flexible diskettes.

A variety of units is available for both 13cm and 20cm diskettes.

The range includes flip-file binders for housing up to 20 diskettes, desk files with a capacity of either fifty or thirty diskettes and desk easel binders whose capacity, particularly in the 13cm size, can exceed sixty diskettes.

For further information contact Twinlock Australia at Box 221 Cheltenham, 3192. Telephone (03) 584 4000. □

Sales Seminars

A NOTE to struggling computer stores and salesmen: with the recession now being official, and with the big computer companies (IBM, DEC, ICL, Wang, and so on) coming into the market, there is only going to be room for professionals. There will also be a lot of lean and hungry salesmen around.

Recently we came across a book called How to Master the Art of Selling, by Tom Hopkins. Normally sceptical about books which people recommend ('This book will change your life...'), we thumbed through this one, then read it.

It really is what it claims to be — if you follow the instructions given in this book, you can be a top-earning sales professional.

Hopkins is president of Champions Unlimited, a sales training company now turning over in excess of $80 million a year. A millionaire at 27, he achieved his phenomenal success at selling real estate — eight hundred homes in seven years.

He now holds seminars for 12-15,000 people each month, charges $10,000 a day and works three days a week, 50 weeks a year.

His book outlines simple techniques which will improve a sales person's performance — some of them known for years, some of them new wrinkles — such as handling objections, how to pre-plan presentations, and the G.O.Y.A. principle (Get off your backside, Get out into the field and Get to work).

Hopkins will be in Australia to present seminars in Brisbane (August 16), Sydney (August 19) and Melbourne (August 24). At only $65, these seminars could be a great investment. Further details from Tom Hopkins Champions Unlimited, PO Box 650, Double Bay NSW 2028, or ring (02) 36 7724, (03) 690 7900 or (07) 376 1314.

By the way, Hopkins' clients include IBM, Tandy Corporation, Storage Technology and others; if those guys outsell you, don't say we didn't warn you! □

Diablo 400-Character Daisywheel

A DAISYWHEEL printer that can print over 400 different characters from the one printwheel has been released in Australia by Mitsui Computer Systems.

Designed and manufactured by Diablo Systems, for whom Mitsui is sole Australian distributor, the new printer is designated the model 630 ECS (extended character set).

It utilises printwheels that contain two rows of 96 characters each, providing a basic set of 192 characters and symbols.

By combining these, as many as 250 additional characters or graphics can be constructed using the newly designed Diablo printer carriage which provides automatic vertical movement between the rows.

For further information contact Mitsui Computer Systems on (02) 929 9921. □

New Agencies

COMPUTERS GALORE, the microcomputer shop in Sydney's Neutral Bay, has acquired two new computer agencies to strengthen its line-up of business computers.

The shop, which has operated successfully since last December as an Apple dealership, has added the Adler business system and Osborne portable computers to its range.

Manager Steve Colman, himself a businessman of over 20 years experience, believes Computers Galore is Sydney's leading independent computer shop catering for the businessman.

Computers Galore is running free evening seminars on program packages for specific trades, professions and businesses.

For further information contact Steve Colman on (02) 908 2355.

Anderson Terminal

ANDERSON DIGITAL Equipment, one of the largest peripheral equipment suppliers in Australasia, has released its own terminal to compete for a large share of the DEC terminal user market.

A compact and lightweight ANSI 3.64 video display terminal, the ADE100 is aimed directly at the DEC VT100 market, believed to be one of the biggest in this country.

ADE claims its new product arose from the need for a more cost-competitive product than the DEC VT100.

In addition to the basic DEC-VT100/–fl features, the ADE100 provides 12 programmable function keys that can each store up to 20 user-defined characters.

The ADE100's convenient SETUP mode allows the user to view all operation parameters in plain English. An operator can simply key through these parameters to adjust brightness, turn cursor blink on or off, set baud rates, and so on rather than having to adjust knobs or switches.

For further information contact Anderson Digital Equipment at 14 Whiteside Road, Clayton, 3168. Phone (03) 544 3444.

The US Mail

USERS OF The Source can now send letters to any address in the USA direct from their office or home computer.

Until recently, Source users could send and receive electronic mail from other members by 'posting' it to the recipient's electronic mailbox for him to receive the next time he was on-line.

Now you can send a hard-copy letter to the USA electronically by using The Source's Mailgram facility — the letter will be delivered to almost any address in the the following day.

Typical charges are $5 for up to 100 words, and $6 for between 100 and 200 words.

This facility will be of great use to business-people with the need for fast, efficient mail delivery to the USA when the recipient does not have access to telex, and without resorting to the expense of overseas cable messages.

For further information on Mailgram, and the 2200 other services of The Source, contact Seahorse Computers at Camden, 2570. Telephone (046) 66 6406.

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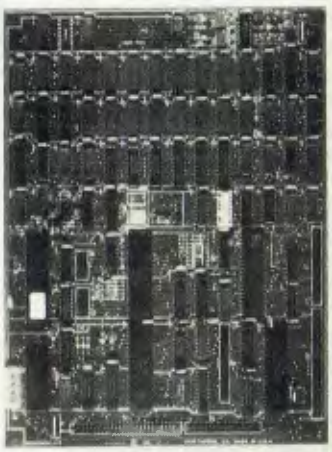

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- Fantastic value at only $995.00 (plus sales tax).

Fully configured CP/M 2.2 to suit the 'BULLET' includes extra features for auto sensing drive density and single/double sided operation. The enhanced CCP adds new features to CP/M and improves some of the old ones. The iobyte is fully implemented.
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Engineering Apples

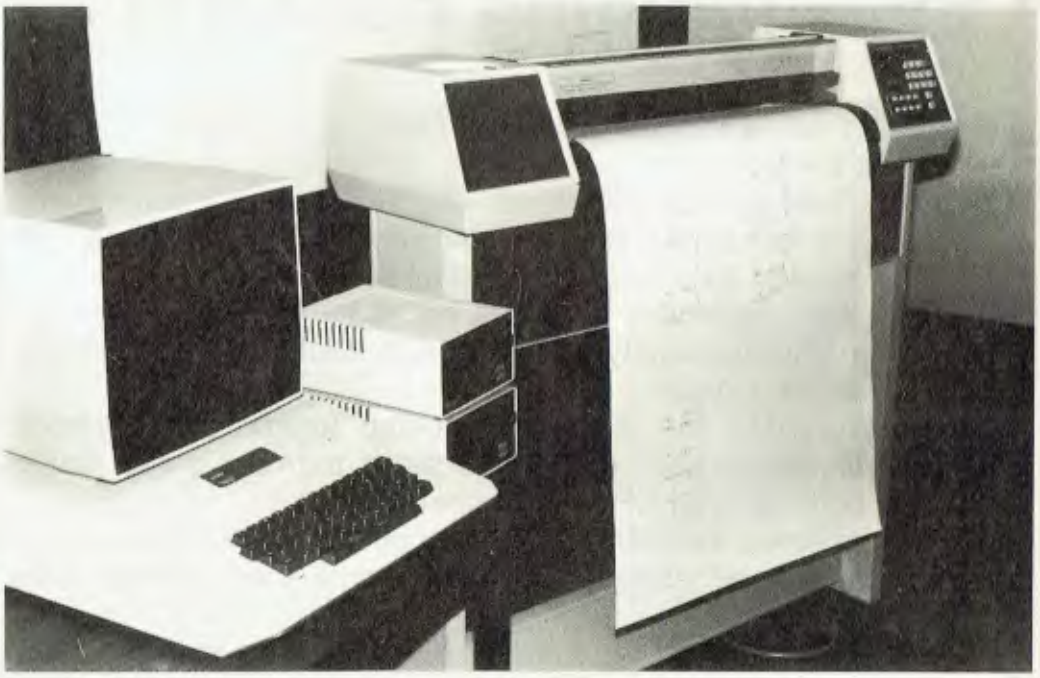
ANALYSE a model of the Sydney Harbour Bridge with its 85 nodes and 168 main members in only eight minutes — that was the demonstration used by Seahorse Computers' Engineer/Programmers at a recent symposium held at the School of Civil Engineering at NSW University.

Seahorse was the only company able to demonstrate actual working programs which not only carried out serious computations at computer speed, but were able to produce proper plots and diagrams of their data instead of reams of hard-to-follow figures.

The diagrams are produced on a range of plotters ranging from $1100 tabletop models to the full-sized Hewlett-Packard 7580A.

Plotters driven by mainframe computers have become common in many large civil and structural engineering offices. These enable data, plans, and contour information to be worked upon and the results sent to the X-Y plotter for the production of diagrams, plans and so on.

Seahorse Computers and civil engineering specialist, Dr Peter Bloomfield, have been doing development work for their local council, Camden, which uses Apple computers in its Civil Engineering Department. This extension involved interfacing the Hewlett-Packard plotter to Apple Computers to run roadworks, contour and drainage programs.



An Apple system, running under BASIC, CP/M, MBASIC, Pascal, COBOL or Fortran can handle large amounts of data and can cost less than firms pay for a dumb terminal. The advantage of the self-contained Apple is that it is available all the time.

Because the programs have been written in a CP/M environment, they are transferable to a number of different types of computers, ranging from the Apple to Prime systems. The latest sale has been on an Archives computer, chosen by a country surveying company because of its rugged reliability.

For further information contact Seahorse Computers of Camden, NSW. Telephone (046) 66 6406.

Moving House

SYDNEY'S Microcomputer House has moved after 14 months in Regent Street to much larger premises in Abercrombie Street, Chippendale.

The move results from increased sales of business and home computer systems. The new Microcomputer House has two showrooms so that business system sales can be separated from home computers.

With the increase in size, the company will be expanding its range of products and the already extensive range of software.

For further details visit the Microcomputer House at 116-120 Abercrombie Street, Chippendale, or phone (02) 698 7866 or 698 7076.

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Melbourne Paperwork

SYDNEY headquartered Paperwork Systems (PSI) has opened a Melbourne office to provide marketing and support services for the company's southern region marketplace.

Paperwork Systems activities within the region will be based on its range of PIICION, Datapoint and BTI hardware together with turnkey systems for broadcasting and television, advertising agency, publishing distribution and cable television systems.

Paperwork Systems' Melbourne office will be located on the 6th floor of 3 Bowen Crescent, South Melbourne. Its telephone number will be (03) 267 7555.

Getting Sirius

A NEW low-cost personal computer for business has been introduced by Barson Computers in Melbourne.

Known as Sirius 1, the machine combines a fast and powerful 16-bit microcomputer with up to 896K of internal memory at a starting price of $5295 plus tax.

Barson Computers is better known to dealers around Australia by the company's old name, Consolidated Marketing Corporation, the distributor of the well publicised Acorn BBC microcomputer.

Sinclair Equipment Australasia, a wholly owned subsidiary of Barson Computers, is also well known as the distributor of the Sinclair ZX-81.

Glenville Homes, one of Australia's largest privately owned building companies, is providing financial backing for Barson Computers.

For further information contact Barson Computers at 86 Nicholson Street, Abbotsford, 3067. Telephone (03) 419 3033.

Getting To Know You

DICK SMITH has launched a book which "takes the mystery out of computers, and explains how the average person, with no technical knowledge, can use and enjoy them".

These words, from the cover, set out to explain what this new title is all about.

Even with the huge numbers of computer books and magazines around today, Dick says he couldn't find anything simple enough for the layman to understand. So, in association with Horwitz Publications, he set out to produce a book which anyone can read and understand.

The $6.95 book is available from all Dick Smith Electronics stores, booksellers and larger newsagents. It will also be available from some specialist computer stores.

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The Spectrum

SOME updated details on the new Sinclair Spectrum, including the answers to questions several readers have asked, have come to us through Sinclair columnist David Brudenall.

Your Computer carried scoop details of the powerful new machine in its May issue, and followed up last month with photographs which arrived just one day late for the previous report.

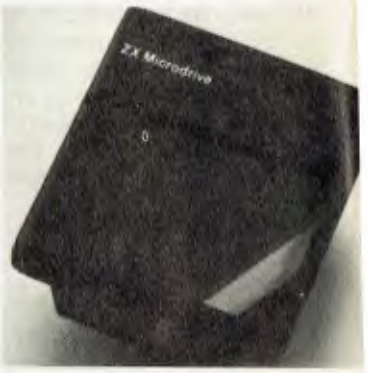
Now David has some further details for ZX fans:

The Spectrum features 'real' keys — not typewriter style, but more like a calculator (if you've seen a TRS-80 Colour computer you'll know what I mean). There are 16K and 48K RAM models, at about 125 pounds and 170 pounds respectively.

The one-key-entry feature is retained, although now it is more complicated — there are two shift keys, which perform different functions!

There is a built-in loudspeaker, and sound can be easily programmed using the SOUND and BEEP commands.

The Spectrum BASIC is more comprehensive than ZX81 BASIC, although it is not MicroSoft BASIC. Functions such as DATA, READ, RESTORE, DEF FN are supported, as well as other ones



such as OPEN, CLOSE, CIRCLE, FLASH, INK, LINE, MOVE, ERASE, POINT, CAT, FORMAT, VERIFY, MERGE, PAPER, BRIGHT, OVER and INVERSE; not to mention all the 'normal' ZX81 keywords.

The cassette interface runs at 1500 baud, five times faster than the ZX80 or ZX81 cassette information speed. And not only that, but recording information to cassette is also far more sophisticated — a tone leader is recorded onto the tape to remove replaying tape speed irregularities; a Schmitt trigger is used to remove unwanted noise; the program, screens, sections of memory, strings and so on may all be saved separately; program tapes can be merged, and SAVEings can be verified after recording, to ensure error free reloading!

The Spectrum operates at the same speed as a ZX81 at FAST mode, but with the flicker-free screen display of SLOW mode.

The character set is ASCII, rather than the old, non-standard character set.

ZX81 programs can be typed ilto the Spectrum, usually with only minor changes needed, although ZX81 programs on tape will not load into the Spectrum.

The Spectrum has a Z80A microprocessor, running at 3.5MHz, with a 16K ROM and 16K/48K RAM on board (16K version has space for further 32K).

Keyboard has upper/lower case with caps lock key; 40 keys altogether. Usual Sinclair-type BASIC keywords, 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. The keys automatically repeat if you hold them down for a second or more.

High resolution graphics are of 256 by 192 pixels (same as Apple), with facilities such as LINE, CIRCLE, DRAW, PLOT and PLOT OVER commands.

It has an expansion port with interfaces for ZX Printer, the Microdrives, and an RS232 connection. Width is 233mm, depth 144mm, and height 30mm.

The Spectrum comes with two manuals — one for beginners and the other a more advanced manual for those with previous computing experience.

It has eight colours — both foreground and background selectable. Up to eight of the Microdrives can be connected at any one time.

Microsoft in Australia

MICROSOFT, the largest personal computer software company in the United States, has entered a joint venture with Australian company Wiser Laboratory to market its products in Australia.

The new venture, Wiser/Microsoft, will fabricate and sell all Microsoft's consumer and OEM products, including the large range of expansion products for the Apple computer, computer languages and business packages.

The company's general manager is Linda Graham, formerly product manager with ComputerLand Australia.

Microsoft has been at the forefront of personal computer software in the US since its inception in 1975. The company began with one product, a BASIC language interpreter that has since become the industry standard with over three-quarters of a million installations worldwide.

New products to be released shortly include several powerful new business packages — Multiplan electronic spreadsheet and The Manager series.

The Manager Series is a group of three interactive programs designed to help managers allocate time and resources efficiently. The three programs — Time Manager, Project Manager and Personnel Manager — will operate independently or Project Manager can be run under the control of Time Manager, with automatic updating from each to the other.

These three programs are the first of 36 planned in The Manager series — all will interact to make the manager's life easier and more productive.

Multiplan is the latest generation electronic worksheet program. Since these programs first appeared on the microcomputer scene a couple of years ago, they've become almost mandatory for any business user of these machines.

For more information on Microsoft's products or for the address of your nearest dealer write to Wiser/Microsoft at PO Box 95, Forestville, 2087.

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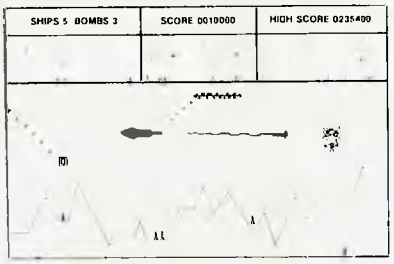

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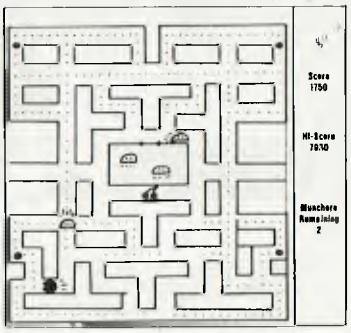

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Electronic Handwriting

A PERSONAL hand-held word processor has been developed by a company based in southern England.

Called the Microwriter, it weighs only 735 grams and measures 230mm x 117mm x 50mm. Powered by a battery giving at least 30 hours use, it has a five-finger keyboard which enables the user to write the entire alphabet and numerics.

The keys are used in combinations relating to the shape of the letters of the alphabet. By depressing the keys simultaneously in various combinations letters and numbers are formed and are displayed either on an inbuilt display panel on the processor or by connecting it to an ordinary domestic television set. The text can then be reviewed or edited.

The manufacturer claims the system is faster than handwriting, can be used by those who cannot use an ordinary typewriter and that anyone can master the technique in less than an hour. Printed copy can be obtained by plugging the processor into a printer or an electric typewriter.

The Microwriter is already available in the United Kingdom where there are more than 2000 users. It will be launched on the American market later this year and in Europe in 1983.

For further information contact the British Consulate-General, Gold Fields House, Sydney Cove, Sydney, 2000. Telephone (02) 27 7521.

DEC Symposium

SIX HUNDRED delegates from Australia, New Zealand and South East Asia are expected to attend the annual symposium of the Australian chapter of the Digital Equipment Computer Users' Society (DECUS) in July.

DECUS is the largest users' society in the industry with a worldwide membership of approximately 40,000. The four-day Melbourne symposium will feature presentations by both users and Digital Equipment personnel, workshops, panels and papers.

For further information contact Digital Equipment Australia at Chatswood Plaza (North Tower), Railway Street, Chatswood, 2067. Telephone (02) 412 5252.

Software In Liverpool

COMPUTER Focus at Liverpool is providing the VIC-Soft range of games and personal/business software for the VIC-20 personal computer and reports a strong and growing interest in these products.

With the release of the Arfon microcomputer expansion unit and other products, the company says the VIC-20 is offering an affordable upgrade path to become a very effective personal colour computer with potential for many applications needed by users.

The company also sells Apple computers and software, which it says has the usual enormous popularity with both business and personal computer users.

Computer Focus has recently been appointed a Sharp dealer as well and is supporting the Sharp PC3201 Business Computer with a range of business software and technical service.

Business software includes general ledger, debtors, creditors, stock control, payroll, accounts, ledger, and time cost.

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THE TECHNOLOGY research, publishing and consulting organisation The Yankee Group has announced the availability of its Communications/Informations Systems Planning Service in Australia.

According to a spokesperson, the CI/S Planning Service offers five unique features:

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The cost of the C/S service in the USA is US$11,500 a year, and the group claims in excess of 97 percent renewal rate. For its first year in Australia, the programme is being offered at A$9800.

For further information contact The Yankee Group at 158 Avoca Street, Randwick, 2031. Telephone (02) 399 8631.

Low Cost Printer

THE COMPUTER Company of Milsons Point, Sydney, has been appointed Australian distributor for a letter quality printer which it says combines a new low price with reductions of up to two thirds in the cost of print ribbons.

Manufactured by Brother Industries of Japan, the 16 character per second Brother HR-1 daisywheel printer sells for $1595 (including sales tax).

The printer uses typewriter ribbon cartridges which cost about a third the price of traditional printer ribbons for letter quality output.

A choice of interfaces is available with the HR-1: RS 232, Centronics compatible 8-bit parallel, Qume compatible parallel and Diablo compatible parallel.

For further information contact The Computer Company on (02) 436 1733.

Free Magazines

SOFTALK Publishing in the United States is offering a new monthly, Softalk for the IBM Personal Computer, free to owners of personal computers.

The first issue features an article on banking applications for the PC, a summary of PC bugs, a description of the new disk operating system, and an article on Software Arts, the company that designed VisiCalc.

Monthly columns cover spreadsheet use, hardware and system software. There is a special column for beginners. In addition, each issue includes news, reviews, and a list of best-selling software.

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VIC v Microbee v Super 80

The Bee, Or Not The Bee?

The question we are most often asked is what kind of microcomputer our readers should buy. This is especially true of the low-cost end of the market, where machines like the Applied Technology Microbee, the Commodore VIC and the Super 80 offer very different features at similar low prices.

THAT IS *the* question. Every month, we receive a stack of letters, all with the same question: 'What kind of computer should I buy?'.

Many people are particularly interested in three machines in a narrow price range: the Applied Technology Microbee, the Commodore VIC, and the Dick Smith Super 80.

In this article, we'll try to give some information to help you decide, but be aware we believe there is no such thing as a 'best' computer (except Godbout...). Some computers may be better for your application than others, and many will inevitably be a compromise; therefore we do not recommend one machine over another in such an indistinct market, but set out to help you investigate fully before buying.

The Microbee

The Microbee was announced in the February issue of this magazine, and is available in kit form for $399 from Applied Technology. Based on a 2 MHz Z-80 processor, the Microbee puts together much of the technology AT had been putting into its S-100 boards for some years — in updated LSI form.

The Microbee consists of two boards: the upper board carries a mixture of RAM and ROM, while the lower board has the processor, video display circuitry, cassette interface, tone generator, keyboard, optional parallel and RS-232C serial interfaces and control circuitry. The power supply is based on an external 12V plugpack which simplifies the mechanical assembly somewhat, as well as allowing a lower profile case.

The availability of dense, low-power memory is part of the design philosophy of the Microbee. The basic unit has 16K of RAM — enough to run most programs, but expandable to 32K on board if required. Furthermore, the memory is CMOS, drawing very little current, and making battery backup a possibility. Thus the computer can be switched off, but the battery will retain the program in memory. This eliminates a lot of the tedium of using a cassette interface.

On the other half of the core card is space for up to 28K of ROM. Normally, 16K is used for MicroWorld BASIC, and the rest is empty, but AT has recently released a plug-in text editor/assembler package which will delight the machine language programmers in the community.

The space can also be used for games; our office system has an excellent chess program in there.

The video display circuitry is based upon the MOS Technology 6545 programmable video generator chip, and this lends an extra flexibility to the design. Since the display format is programmable through a set of registers on the chip, the display can be varied from its normal 64 by 16 format to 40 by 24 (like Apple) or even 80 by 24, like professional systems.

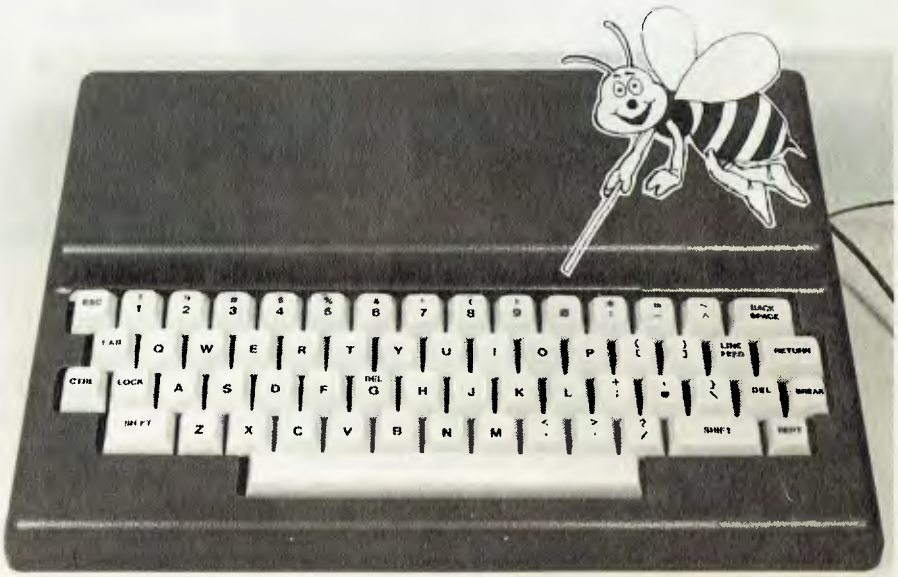
The result is extremely flexible operation. Under a CP/M upgrade to be announced this month, the Microbee will be able to run professional-grade software such as WordStar and other CP/M programs. This will give Microbee owners access to a wide range of high-quality software for the cosp of a disk system.

Another aspect of the video circuitry is the use of a RAM as a programmable character generator (PCG). This allows the user to create special shapes for screen display of graphics, games and so on. Under MicroWorld BASIC, the PCG statement will switch all print output to the user-defined display set in the PCG.

Two graphics modes are available on the Microbee. The first is low-resolution graphics on a 128 by 48 matrix. This is the same type of chunky graphics used on the TRS-80, and is good for general games graphics. The high-res mode allows up to 512 points across the screen, and 256 down.

The high-res mode does not use a bit-mapped display, but rather utilises the PCG through software which makes the PCG generate the correct display shapes in a manner that is transparent to the user. So, for example, the statement SET(256,128) would not set a bit corresponding to that location on the screen, but rather set one bit in the PCG and then map that character to the appropriate location.

The only problem with this approach is that if enough random points on the screen are set, then one fills up the 128 PCG locations fairly rapidly and no more can be displayed. Fortunately, most



graphics being displayed are more ordered than this, and use the same shapes (particularly horizontal and vertical line segments), so that it is unusual to run out of PCG space.

As well as the SET(x,y) and RESET(x,y) statements, MicroWorld BASIC includes a statement PLOT (x1,y1) TO (x2,y2) [TO (x3,y3)], which draws lines on the screen. Using this statement, line graphs can be generated very quickly with almost no work.

The video display, then, is a bit of a compromise in the graphics area — but a workable one — yet has plenty of steam when dealing with text.

The keyboard is a conventional QWERTY type with real keys, making it possible to touch type.

On input of BASIC programs, the Microbee allows line editing, using control keys to move the cursor left and right a character or a word. The control-L key will move the cursor to the right, changing upper case to lower case as it goes, while delete will delete the character under the cursor. Any other character will be entered into the line.

A special feature to aid conversion of other programs into MicroWorld BASIC is the global search-and-replace command. Using this, all or some occurrences of a particular string throughout a program can be turned into some other string; for example, PRINT could be turned into LPRINT. Whenever the target string is found, it will be displayed; hitting the period key will cause the change to be made, BREAK will abort the command, and any other key will skip over the string.

MicroWorld BASIC is loosely based on Whipple and Arnold's BASIC ETC which was originally available from East Texas Computers. However, it has had such a 'going over' since then that it is barely recognisable. For the most part, it is a standard sort of BASIC; however, it has a umber of extensions and unique features. String handling is not like Microsoft BASIC; instead it is patterned after Hewlett-Packard's minicomputer BASIC. However, the manual shows how to emulate the LEFT$ and RIGHT$ functions found in other BASICs.

A particularly nice and powerful feature of the BASIC is the VAR statement which, when inserted into subroutines, allows passing of parameters by value rather than by name. This is rather like the user definable functions found in other BASICs.

Other neat features include variable maths precision from 4 to 14 places; user definable prompt for input statements; easy interface with machine language programs; data input/output from keyboard, external keyboard, cassette and RS232C; versatile renumber command; trace facility; variable print zone width and single character keyboard input (like INKEY$).

The Microbee has been selected by the NSW Department of Education as an approved contract item for computers in schools, so a lot of schoolkids can expect to see one in coming months. By the time you see this, production should be running at 1400 units a month, so that AT can meet the outstanding demand which met the Microbee on its launch.

Many schools are buying five to ten Microbees for use in a classroom network. In particular, is are working on the development of suitable modems to allow downloading of software from a mass storage manager.

As mentioned above, a 64K CP/M version of the Microbee should be available very soon, running 13cm disk drives. Prototypes are working now, with a number of very nice features, such as automatic background memory testing. Each soft-sectored disk will have a storage capacity of 180 Kbytes.

Overall, then, some very exciting things are happening around the Microbee. It is a computer which should appeal to the experimenter or the user who feels he'd like eventually to expand to a CP/M system, as it is capable of expansion to a considerable degree.

```
06000 REM This subroutine draws a square of lengths l1,l2
06005 REM with the bottom corner at a1,b1
06010 VAR(A1,B1,L1,L2)
06020 REM Draw left side, then top, then right, then bottom
06030 GOSUB [ A1,B1,A1,B1+L2 ] 4000
06040 GOSUB [ A1,B1+L2,A1+L1,B1+L2 ] 4000
06050 GOSUB [ A1+L1,B1+L2,A1+L1,B1 ] 4000
06060 GOSUB [ A1+L1,B1,A1,B1 ] 4000
06999 RETURN
65000 END
```

Commodore's VIC

The Commodore VIC is more of a home computer than the MicroBee. Based on a specially developed integrated circuit (from which it takes its name — Video Interface Chip), the VIC is very much oriented towards home entertainment and game playing.

The VIC is mounted in a plastic moulded box not much larger than the keyboard itself. The keyboard is a complete QWERTY, with real keys, and there are four user/program definable keys on the right side of the keyboard — very useful for games or untrained users.

The display is colour, and plugs, via an RF modulator, into a domestic television set.

Because of its colour display, the number of characters per line is reduced to only 22; but many VIC owners, being non-typists, would find it hard enough to type 22 characters, let alone 80, so that's not really a problem! There are 23 lines on the display.

Eight colours are available (white, red, cyan, purple, green, dark blue, yellow and black), and the colours are marked on the keyboard, so you don't have to remember a number/colour sequence. The screen surround can also be set to whatever colour you choose. The background colour can also be set to your choice — in this case 16 colours are available.

In addition, the VIC can display a set of graphic characters, which are also marked on the front of the keys, making programming a snap. The graphics are of the 'chunky' variety, and a high-res graphics facility which increases resolution to 176 by 176 is available as an option.

The VIC has 5K of RAM as standard, and 16K BASIC in ROM. The BASIC is extensive and easy to use.

For those whose games are incomplete without sound effects, the VIC is a treat with its three-voice sound register. For fumbly musicians, this is great as it allows lots of messing around with harmonies at various sound levels.

The 5K of RAM is enough for writing simple programs and for plug-in machine code cartridges to use as workspace, but many users, on discovering the power of BASIC, will want more space. The VIC has an expansion port on the back, through which a number of options can be added.

Most users will encounter the expansion port when they plug a games cartridge into it. A number of games are now available, and most, being written in machine code, provide high speed graphics which are striking. For those who are addicted to games parlours, here is the answer.

But the expansion port can also be used to add more RAM, ROM, floppy disk and other peripherals.

The Super Expander cartridge contains another 3K of RAM, high-res graphics with colour paint and drawing commands as well as music. The Programmer's Aid includes renumber, trace, redefinition of keys as subroutines or commands and other functions, while the VICMON machine language monitor will allow development of machine code using a line-by-line assembler/disassembler.

Other expansion cartridges include 3K, 8K and 16K of RAM and an IEEE-488 interface. There's also a disk drive with 170K storage capacity.

One major area where the VIC is expensive is the add-on cassette drive. At a price of $99, many VIC owners would prefer to use their unused audio cassette recorder, as many other computers do at low cost. It might be more reliable, but the VIC's add-on hits the pocket pretty hard.

A number of VIC programs are available on tape, ranging from games to home calculations and a programmable character set and game graphics editor. Also available is VICterm I, a program which converts any VIC to a dumb terminal operating through its RS-232C interface and a modem.

Other goodies for the VIC include a graphics printer, multi-cartridge expansion module, programming courses, joysticks, paddles, books and manuals.

As personal computers go, the VIC is certainly one of the easiest to use, and the plug-in games cartridges are a lot of fun.

We found the cassette games were rather slower and less exciting, perhaps because they are written in BASIC. There's room for a lot of fun in writing your own games, particularly since some simple software tools are available to assist with machine code and high-res graphics.

Overall, the VIC is very much a home computer. Good with kids, but with sufficient expansion and complexity to puzzle adults at the same time.

Mr Howard increases sales tax by 2%.

How does this affect your company's profits?

15 seconds to answer.

You're probably solving this sort of problem by pulling out an analysis pad and drawing up a spreadsheet by hand – taking your budget and recalculating every value in a series of columns – then checking them. If you're lucky you have a programmable calculator to help.

Here's what you should be doing: Multiplan running on a personal computer replaces pencils, paper, erasers, calculators and endless manhours in modelling, estimating and planning activities. Like the example here: if your sales tax rate is 17.5%, you simply put that figure at the top of the sales tax column – Multiplan calculates each product's sales tax value. If a price changes or the tax rate changes, you change one number –Multiplan changes the rest. You see all the results on a spreadsheet 63 columns wide, 255 rows deep and pages thick.

Multiplan is a computer program for non-computer people. Multiplan lets you assign names to cells or areas such as 'sales' or 'expenses', then lets you refer to that name in future formulas. On Multiplan you can have a formula like:
Profit = Sales – Expenses
On other spreadsheet programs that would look more like:
Profit = R1C3 – R5C12
Multiplan is also the only spreadsheet program capable of colour operation and there are none of the problems with forward reference handling that can cause other programs to give completely spurious answers. Multiplan lets you access data on other spreadsheets and allows multiple windows on the screen so you can see the effects of new entries on other parts of the sheet.

Change this number to see the effect of a sales tax change

All dependent variables are automatically calculated to your formula

Column widths are individually variable

Simulated screen

PRODUCT	RRP	SALE INC T	S.TAX 17.5%	COST PRC	FRT	UNIT SALES	TOTAL SALES W $	TOTAL COST	GROSS MRGN	GROSS PROF
STD MODEL	10.00	5.00	.86	3.00	.25	1.20	703.20	493.20	29.86	210.00
DELUX MOD	20.00	11.75	1.75	6.00	.50	.86	1010.50	709.50	29.78	301.00
STD-CHROME	15.00	8.81	1.31	4.50	.30	2.64	2325.84	1613.04	30.65	712.80
BASE TYPE	8.00	4.70	.70	2.80	.10	69.46	32646.20	25005.60	30.55	7640.60
OPTION PI	30.00	17.62	2.62	9.00	.60	.57	1004.34	696.54	44.19	307.80
EXPORT TYPE	12.00	7.05	1.05	3.00	.20	2.81	1981.05	1194.25	39.71	786.80
SPEC INPUT	16.00	9.40	1.40	4.80	.25	7.24	6805.60	4669.80	45.73	2175.80
DISPLAY PKG	15.00	8.81	1.31	4.50	.30	3.22	2836.82	1967.42	44.19	869.40
HEAVY DUTY	30.00	17.62	2.62	9.00	.60	.74	1303.88	904.28	44.19	399.60
SPEC DISP	12.00	6.93	1.49	5.20	.42	1.92	1918.08	1365.12	28.82	552.96
TOTALS							52435.51	38619.75		13816.76

Multiplan is expected in stock and the price is correct at time of going to press.

Call into your nearest computer store and see Multiplan in action – your next forecast need only take you 15 seconds instead of hours.

Multiplan Apple II version: $295 + tax

from **MICROSOFT**

For the name of your nearest Microsoft dealer or more information on Multiplan contact:

Wiser-Microsoft
PO Box 95, Forestville 2087. Ph (02) 451 9445

A friendly system. Multiplan is specifically designed to eliminate the routine and tedious tasks associated with forecasting, modelling and planning. In designing the program, Microsoft, the world's largest producers of personal computer software, aimed to provide users with an easy-to-use tool which maximizes executive thinking time while minimizing the time required to learn and use the system productively.

Multiplan is available right now for use on Apple™ computers, and will soon be available for use on the Osborne 1™ and standard 8" CP/M™ computers. Versions for other computers are under development.

Glover & Assoc. WM/6

Dick Smith's Super 80

Originally described in a constructional article in Electronics Australia magazine, the Super 80 is available as a kit from Dick Smith stores.

The fact that it is kit-only, while the VIC and Microbee are assembled and tested, means it will probably appeal mostly to electronics enthusiasts who feel confident about which end of a soldering iron is the hot one.

Based on the Z-80 micro, the Super 80 is available in a number of configurations, from a basic unit up to a full 48K of RAM on board. The basic unit features 16K of RAM and a monitor program in ROM memory — all that is required for simple applications.

The video display features 14 lines, each of 32 characters, using a direct memory access circuit which can display any 512-byte section of memory. Although the basic circuit offers only upper case, a lower case character generator is available as an option. There is a full keyboard (virtually identical to the Microbee's).

Also on the board are an RF modulator (so the output plugs straight into your TV antenna socket), a cassette interface, and optional circuitry which allows expansion through an S-100 connector at the rear of the machine.

The simple monitor is actually not so simple — it will allow considerable work to be done in machine code — and we understand an editor/assembler is due to be released for the Super 80 shortly along with some other new options.

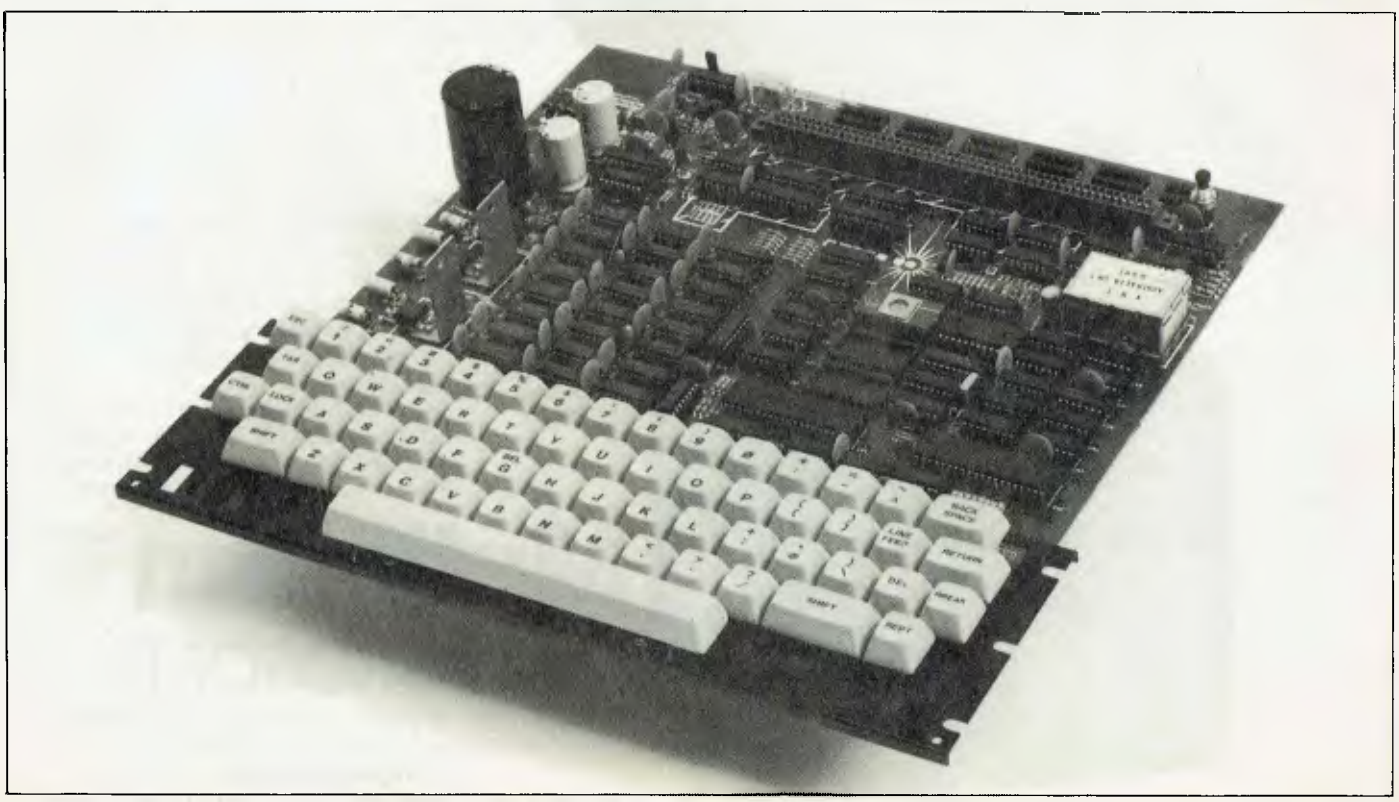
BASIC is available either on cassette or in EPROM chips which can be plugged into the board so that BASIC is always there on power-up.

The cassette interface uses the Kansas City cassette format, so that there is some degree of compatibility with other machines. BASIC takes about two and a half minutes to load, which is quite good.

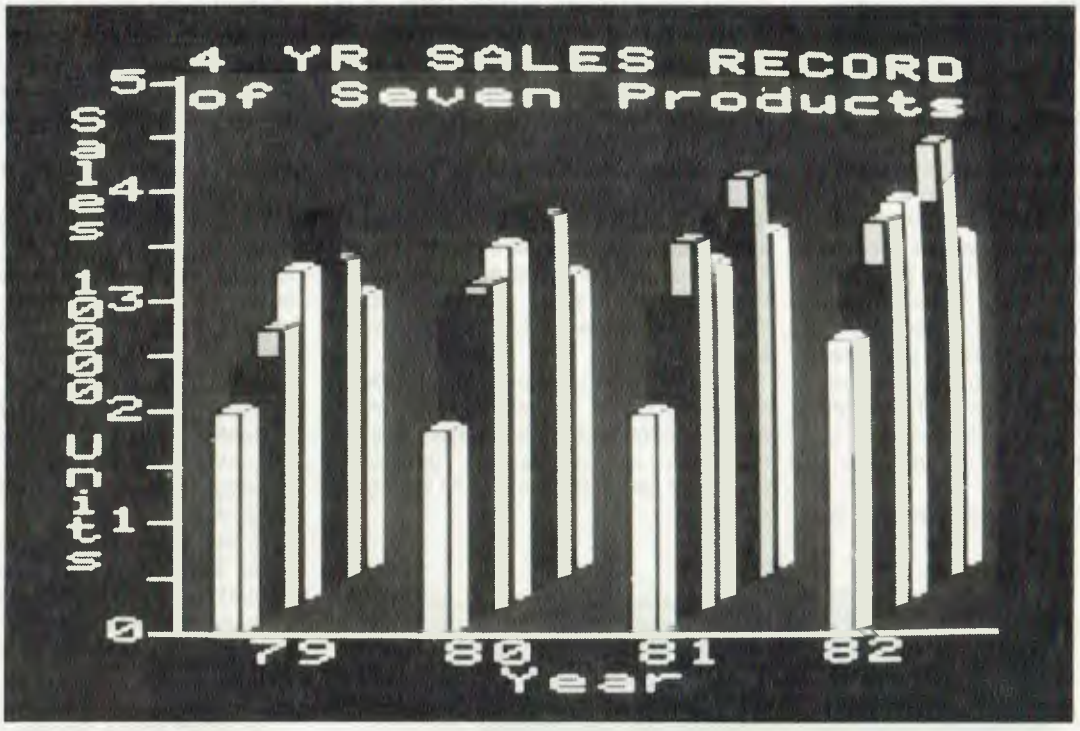
The documentation supplied with the Super 80 is very good, particularly in the area of testing the kit once it is finished. Although a complete novice would be foolhardy to attempt this kit, someone with a little experience should not have any trouble using the assembly instructions and testing the kit as he goes along, so that whenever a problem is encountered, it must be in the circuitry most recently added.

There's a certain satisfaction in building your own computer (some tell me there's a certain satisfaction in smashing it to pieces, too), and for those on a tight budget, this may be the best way to go.

```
          SUPER-80 V1.2

SUPER-80 BASIC   VER 1.2B
READY
*10 PRINT "YOUR COMPUTER "
*20 PRINT "ISN'T AS GOOD "
*30 PRINT "AS MY COMPUTER"
*RUN

YOUR COMPUTER
ISN'T AS GOOD
AS MY COMPUTER

*_
```



The Juicier Apple



Since its release in 1977, the Apple II has become almost synonymous with the phrase 'personal computer' in the eyes of the public. Its larger brother, the more recent Apple III, has not enjoyed the same popularity. Doggedly, Apple Computer has supported it, solved the problems and consumers seem to be justifying its faith, writes Les Bell...

IRONICALLY, Apple Computer has found itself in the same bind as IBM did following the huge success of the IBM 360; it could not afford to relinquish the huge amount of software (thousands of man-years) which had been developed for its machine.

Consequently, the Apple III was firmly rooted in the traditions of the II. It uses the same microprocessor, though with extensions, and has an Apple II emulation mode which allows access to some of the vast software library of the II.

Early Apple IIIs had problems. Everyone (including Apple) admits that. But recent IIIs have worked, and worked well, and the software support for the product is

starting to appear, with the announcement of Apple III COBOL and similar products.

The III is somewhat larger than the II, and certainly heavier. It is based upon a die-cast metal chassis which screens the circuitry and provides a heat sink for the switched-mode power supply. At the front, the full keyboard can generate all ASCII codes (a major problem with the II), and includes a numeric keypad.

The keys can be completely redefined under the control of the operating system keyboard driver program, allowing people who prefer curious non-QWERTY keyboard layouts to use the computer.

Immediately above the numeric pad is a 13cm floppy disk drive. This drive is essential to the operation of the machine, as the operating system, its attendant device drivers, and the languages are loaded off disk. Without an operating system disk, the III is just so much scrap metal.

The back of the machine is made of matt black cast aluminium, with vertical fins to dissipate heat. Along the bottom edge are the on-off switch, power connector, RS-232C connector, video connectors, two joystick ports (one of which doubles as a Silentype printer port), an audio port and disk drive port.

The disk port allows daisy-chain connection of up to three external disk drives, although the operating system will have to be reconfigured to recognise more than one external drive.

Particular attention has been paid to the design of the video output circuitry. There are separate ports for monochrome and colour video signals, and the colour port can be re-wired to drive either NTSC composite video or RGB video monitors. This

latter method will provide very high quality colour video.

The Silentype printer is a small, low cost electrostatic printer which can not only print text, but also graphics and screen dumps.

The Profile hard disk unit for the Apple III is designed to sit on top of the computer, under the video monitor. It connects through an interface card which is mounted inside the computer, with the cable led through a vertical slot in the back of the machine. There are four such slots inside the computer, and they will accept a number of peripheral devices.

Also mounted inside the box are the processor (6502B) with its memory (128 Kbytes to 256 Kbytes), and memory management circuitry, which allows the processor to address more than the usual 64K maximum. The clock speed is specified in a curious way in the manual: 2 MHz peak, 1.4 MHz average. Does this mean the clock speed varies during operation, or that it is adjusted on test at the factory, with the average Apple III running at 1.4 MHz but selected units going up to 2 MHz?

Perhaps even more important than the hardware you can see is the software, which you can't. Central to the operation of the Apple III is SOS, the Sophisticated Operating System.

SOS is based loosely upon some big machine operating system concepts, in particular upon UNIX. Like UNIX, its file structure is based upon a hierarchical directory tree with pathnames, and I/O is device independent. Unlike UNIX, it is only a single-user, single-tasking operating system, though it is interrupt driven, allowing keyboard type-ahead.

The operating system is designed to work with the memory management circuitry around the processor to handle up to 512K of memory. In the current implementation, this is used to provide completely separate execution environments for the user and the operating system, including private page zero and stacks. Thus, the likelihood of the user clobbering the OS is slim.

However, the major justification for having this kind of sophisticated memory management circuitry and software is for multi-user or multi-tasking operation, neither of which SOS currently supports. Hmmmm.

Another reason, of course, is to support relocatable modular code. In the Apple III this feature is used to good effect in the way device drivers are loaded under the operating system as required and linked in. This makes the addition of new peripheral devices (such as the Profile hard disk) a snap (relatively speaking).

The Apple III Standard Device Drivers Manual gives details of the System Configuration Program which is used to modify and install the various drivers. As far as the operating system is concerned the device drivers just look like files. So by opening a file named '.PRINTER', for example, and then outputting to that file, a program can print its results.

A major benefit of this approach is that output of programs can be very easily sent to disk files for later processing, to the console or to the printer just as easily.

Device drivers are provided for the console (always required, obviously), the graphics screen, the printer, the RS-232C port and the audio (speaker) port.

Associated with the console driver, but not really a part of it, is the character set used by the Apple III for its normal character display.

Unlike most computers, the Apple III loads its character set off disk when it is booted up, and it can be changed at any time. An immediate benefit of this technique for Apple is that no special ROMs are required to display foreign language characters such as acutes, graves, and so on.

To assist in this process, the keyboard can be redefined, and in fact, the keyboard layout table is loaded from the SOS.DRIVER file on cold boots as well.

The user can modify the various device drivers using the System Configuration Program, and build a complete set of device drivers in memory. Once this has been done, the complete set of drivers is written out to disk as the file SOS.DRIVERS, and will automatically be read in as part of the operating system on subsequent boots. In fact, this is the way that the Profile is integrated into the system.

By comparison with many other computers, this method of adding new devices is stunningly simple. Adding a hard disk to a CP/M system, for example, often involves lengthy rewrites of assembly language source code, assemblies and debugging (although to be fair, many hard disks are now supplied with programs that automatically install their drivers).

Superb Graphics

The Apple III's graphics performance is superb. There are four graphics modes: 192 lines by 280 dots, black and white; 192 by 280 in a limited selection of 16 colours; 192 by 560, black and white; and 192 by 140 in any of 16 colours.

The graphics driver employs some particularly sophisticated techniques. For ex-

commodore

VIC 20

The Computer for everyone.

Just $399

Why buy just a video game when you can get a full colour computer for this price.

A computer like this would have been fiction a few years ago. Now it's a reality. It's the new Commodore VIC-20, a full-fledged, expandable colour computer that costs little more than the video games.

Everybody loves video games and the VIC-20 has some of the best. But the Commodore VIC-20 can also help the kids with their homework and mum with her home budgeting. Dad can even take the light, portable VIC-20 to the office for financial and business applications. And Commodore has many more applications on the way. With full capability for:

- Education programmes
- Recreational programmes
- Personal computing
- Includes Microsoft, PET BASIC
- Connects to any TV set
- 4 sound generators ● 16 colours
- 66 graphic characters
- Full-size typewriter-style keyboard
- Easy-to-follow instruction manual
- 25K total memory ● 5K RAM
- Memory expansion to 32K RAM

The VIC-20 is the friendliest way we know to learn computing. It has a full computer keyboard even a small child can operate. It plays music, has exciting graphics and lets you create pictures. It even tells you when you've made a mistake and how to correct it. The VIC-20 can take your children from pre-school through post-graduate studies.

Why get just another game that could end up in the closet? Get an honest-to-goodness computer for just $399. Get the Commodore VIC-20.

So much brain for so little.

commodore COMPUTER

MIVII461

ample, a 'Colour Operator Table' embedded in the driver determines which colours can be overwritten by which other colours on the screen. In addition, a viewport can be defined so that areas of the screen outside the viewport will not be affected by any commands in the port.

Colours are placed on the screen in one of eight transfer modes: either stored directly, ORed or XORed with the existing colour or by clearing the corresponding colour bits, together with the logical negation (NOT) of these operations.

The graphics driver is used in exactly the same way as the other drivers; a file is opened and then written to using BASIC's PRINT# or Pascal's write statements. The driver responds to 160 different characters. Standard ASCII printing characters are printed using the current graphics character set, which may or may not be the same as the console driver's set.

The ASCII control codes are used to control the screen by performing such functions as turning the screen off and on, setting the pen colour, drawing a line, plotting a point, setting the viewport, and so on.

The RS-232C driver is particularly sophisticated, and allows various modes from simple serial I/O to more complex XON/XOFF and ETX/ACK protocol communications.

Business Basic

Apple III Business BASIC bears a remarkable resemblance to Microsoft BASIC, and one suspects that Microsoft was involved in its creation somewhere along the line.

Briefly, Business BASIC contains all the functions that you would expect, plus some new ones, so I shan't bother to describe the more mundane statements.

In line with modern thinking about structured programming, Business BASIC automatically indents FOR..NEXT loops. The VPOS and HPOS variables are carried over from Applesoft, akKk with the WINDOW, HOME, INVERSE, NORMAL and TEXT statements.

Also interesting is the EXEC statement, which will read input to a program from a text file (this is akin to the redirected I/O feature of UNIX). EXEC can also be used to batch programs, a la CP/M's SUBMIT, but is much more powerful, as it will cope with any legal BASIC statement, allowing conditional execution of entire programs.

Business BASIC supports long integers, with up to 19 digits, which is ideal for many accounting applications

The SUB$ function allows substitution of any part of a string with another. This makes string editing particularly easy and eliminates the need for lines full of LEFT$, RIGHT$ and MID$.

Type conversion functions allow conversion of string, integer, long and real types into any other, another job that often has to be done by a round-about approach.

PRINT USING has been souped up a bit, so that it now looks rather like a cross between FORTRAN's FORMAT and the COBOL PICTURE. The result is very versatile, so there is no excuse for sloppily formatted output.

An interesting addition is the ability to format numbers in what has become known as 'engineering notation' after the style of Hewlett-Packard calculators; this is a modified form of scientific notation with exponents limited to multiples of three. Finally, the SCALE option allows long integer calculations in cents to be output in dollars by shifting the decimal point.

Control of subroutine nesting is afforded by the POP statement, which removes one level of subroutine return address from the stack. This is one of those statements which is rather open to abuse and could cause endless trouble in some situations. There are some situations where it can be handy, but in general it's probably best to stay away from it.

Since the III is interrupt-driven, it is able to sense a keystroke even when no INPUT statement is being executed. The ON KBD statement allows program execution to be interrupted and the keystroke captured and examined, with normal execution resuming immediately afterwards. Great for highly interactive programs such as games!

File handling is cast in the Microsoft mould, with both sequential and random access. However, there is no FIELD statement; instead a random read will return just the first field of a record, and the field type can be determined with the TYP function. This will return 1 for real, 2 for integer, 3 for long, and so on, or 0 for an indeterminate data type.

The language includes extensions for loading and running assembly language subroutines. The INVOKE statement will load the routines, and they can be executed using the PERFORM statement or the EXFN (returns real) or EXFN% (returns integer) functions. This is very much more sophisticated and easy to use than the kludges used by most systems.

Business BASIC is thus quite useable as a general-purpose system language (as happened with the II and Applesoft). It has a range of extensions equal to any minicomputer BASIC, while retaining a reasonable level of compatibility with 'standard' BASICs.

The Verdict...

With the addition of the new Profile 5 Mbyte hard disk, the Apple III is a serious computer (a term many would hesitate to apply to the Apple II).

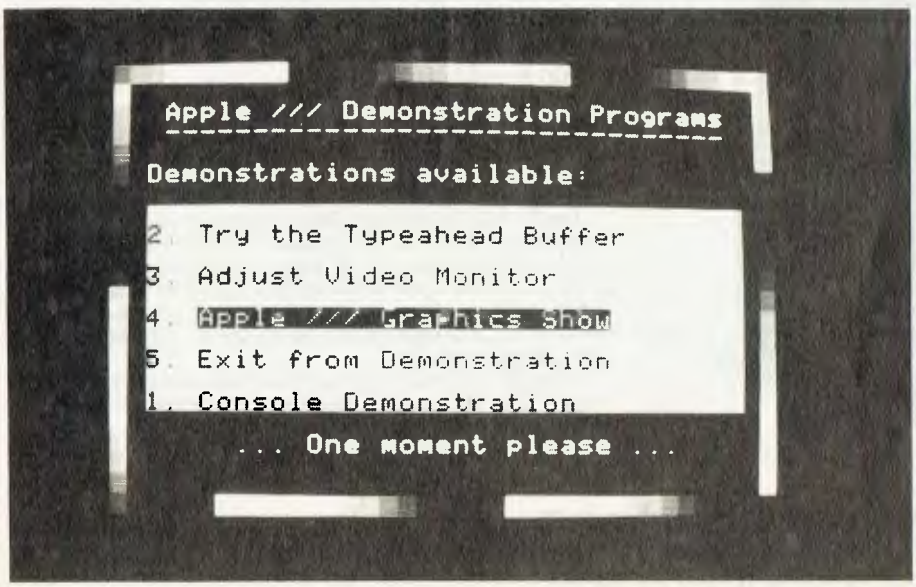
The Profile drive installs easily, following the instructions in the accompanying manual — it's basically just a matter of copying the device driver into the DRIVERS.SOS file on the boot disk. Thereafter, the Profile is just another device to the operating system.

The III is quick; its use of interrupt-driven I/O means the speed requirement is not as important in any case, and the ability to operate in batch mode using the EXEC statement further reduces the need for speed.

All in all, I have to admit that if I wasn't such a perverse, cantankerous devotee to building my own system, I would have to consider the Apple III a contender for my dollars.

It has a good BASIC, Pascal, word processing software, Visicalc, now COBOL and even a new Softcard so I can run CP/M.

Although there's a lot of discussion about the IBM machine killing the Apple III, I just can't see this one lying down and dying. It's too good for that. □



Old-Time Quality – Vector's 3005

One of the old and respected names in the microcomputer field is Vector Graphic. From the introduction of its first S-100 cards in 1976, to the sophisticated business systems it now sells, the Vector name has consistently stood for quality; and, writes Les Bell, that's still true of its latest, the Vector System 3005.

VECTOR GRAPHIC is one of those companies that started by producing plug-in cards for the Altair, the first popular personal computer.

Many of these 'early days' manufacturers are gone: IMSAI, MITS, Processor Technology...all gone, replaced by younger companies such as Apple and Tandy. Vector Graphic is one of a very few survivors from that era, and when one looks at a Vector system one begins to realise why it made it.

The most recent Vector system, the Vector System 3005, is compact yet powerful, with a range of mass storage options. The core of the unit is the Vector 3 console, which contains a video display, keyboard, and S-100 card cage.

The 6-slot motherboard on our evaluation sample carried the 4 MHz Z-80A processor on a single-board computer card,

64K of RAM (56K useable), a floppy disk controller, memory-mapped 80 by 24 video card, 5 Mbyte micro-Winchester controller and a cartridge tape drive controller.

The floppy disk and Winchester are mounted side by side in a small enclosure which sits by the computer, while the cartridge tape drive occupies a similar enclosure. Incidentally, the tape controller board also carries a battery-backed real time clock.

The floppy disk is double-sided double-density, with a storage capacity of 600K. Two additional floppies can be added if required.

The printer supplied with our review system was a NEC Spinwriter. This is supplied as an integrated part of the system, complete with driver software which automatically implements all the appropriate protocols (on some systems, the printer can only be driven by the word processing software!.

The keyboard has a comfortable feel and is sloped for minimum finger movement. At the right side is a numeric keypad and a set of cursor movement keys, while at the left are the escape, delete, caps lock and control keys. The screen has an anti-reflective gauze cover, which relieves eyestrain in brightly illuminated offices.

The video display is based on Vector's Flashwriter II memory-mapped video board. This has an 80 by 24 display, with underlining, inverse video and graphics capabilities. The memory mapped system has a couple of advantages in single-user systems like this one: the ability to display graphics, and to utilise direct access for complex screen displays like the RAID debugger display described below.

The system software supplied as standard is quite impressive.

The standard operating system is CP/M 2.2; however, many of the standard CP/M utilities have been replaced by more sophisticated versions. STAT and PIP are the same as usuaL; however ED is replaced by a screen-oriented editor called SCOPE (SCreen Oriented Prog-

ram Editor), ASM has been supplanted by ZSM, a Z-80 assembler, and DDT is augmented by RAID, a RApid Interactive Debugger, which displays the processor status and registers on the full screen.

The system also contains an extended system monitor in ROM, which is used to boot the system and can also be used for diagnostic purposes. The monitor software also includes dumb terminal emulation in conjunction with a modem or acoustic coupler.

Other standard software includes a modified version of Microsoft BASIC version 5.2; the principal extension is the implementation of direct cursor addressing in the language, almost a necessity with memory-mapped video unless a separate terminal emulator program is supplied.

There are also software utilities which allow backing up the hard disk onto floppy disks or streaming tape.

Optional software, some of which we tried, includes Vector's well-known Memorite III word processing system, the Execuplan spreadsheet calculator, CCA data management system and the Accuchart business charting system for Diablo-protocol printers.

Memorite III

Memorite III is a comprehensive word processing package with a wide range of editing and formatting commands, as well as name and address merging, spelling correction and communications.

The program includes a number of very sophisticated features not normally seen on microcomputer word processing systems. These include proportional spacing, multiple column printing, automatic footnote insertion and boilerplating of paragraphs into documents.

Memorite will normally power up in auxiliary command mode, and text can be entered by hitting ESC twice. Thereafter, many common editing commands are available using control keys, but more complex commands must be accessed by using the control-A sequence to enter auxiliary command mode. In this mode, commands will usually consist of two or three letters, followed by return to cause execution.

Many print formatting commands are embedded into documents, using the delete key as an 'auto-insert' code allowing entry of non-printing command sequences.

Documents can be merged with data files, or with direct keyboard entry. In addition, Memorite allows the operator to type directly from the keyboard onto the printer. Additional commands built into Memorite allow its operation with cut sheet feeders such as the Spinwriter dual hopper feeder.

Documents are filed with certain additional information, such as the author's name, date of creation and last modification, password and write protection status. This allows an extra degree of security on shared word processing systems. On hard disk systems, Memorite allows use of different CP/M user areas.

Memorite also includes commands which allow communication of files with other Memorites systems, although it is limited to documents which are smaller than buffer memory.

The spelling module is run from CP/M, not from within Memorite. It allows correction of spelling in context, as well as the creation of auxiliary dictionaries for specialised applications.

The Memorite user's manual is tutorial in nature, and proceeds through basic topics, to allow the user to start utilising the system on simple documents, before progressing on to more advanced use. It is well written, and intended for non-DP staff such as secretaries.

An additional program allows the creation of mailing lists and printing of labels.

Execuplan

Execuplan is a spreadsheet calculator which uses the display to show results of calculations on an 'imaginary' columnar analysis sheet. The cursor control keys are used to move around the screen entering values or formulae which operate on these values.

The program displays a status line rather like Visicalc's, a formula line, title line and command line. The rest of the display is given over to the worksheet.

Entry of commands is very easy, and the system includes a number of editing functions which help the user. For exam-

Specifications and Report Card

Unit:	Vector System 3005
Made By:	Vector Graphic Inc.
Processor:	Z-80A
Clock Speed:	4 MHz
RAM:	56K useable from 64K
ROM:	Bootstrap and monitor
I/O:	serial, parallel
Languages:	BASIC
Keyboard:	full QWERTY
Display:	80 × 24 memory mapped
Graphics:	chunky graphics
Peripherals:	5 Mbyte hard disk, streamer cartridge drive
Expansion:	S-100
Best Points:	Fully integrated, well supported
Worst Points:	Maximum 56K CP/M with restricted TPA can't run some progs such as Whitesmith's C compiler

Ratings:	**excellent**	**very good**	**good**	**poor**
Documentation:		✓		
Ease of Use:		✓		
Functionality	✓			
Support:	✓			
Value-for-money:		✓		

Extras Included:	NEC Spinwriter printer
Options:	wide range of S-100 add ons
Review Unit from:	Dicker Data Projects Pty Ltd, 78 Captain Cook Drive, Caringbah NSW 2229 Tel (02) 525 2122

ple, control-L will automatically insert the last command typed into the command line, so it can then be edited.

A useful extension of the more conventional spreadsheet calculators is the ability to refer to a cell by its row and column titles. For example, row 2 might be headed 'JAN' and column 5 might contain income figures, titled 'INCOME', but rather than referring to that cell as [2.5], the user can specify it as [JAN,INC]. This is much more meaningful to the casual user, and is such a simple and obvious feature (once you've thought of it) that one wonders why other programs do not offer it.

The System commands allow all the usual things to be done. Files can be loaded, saved, and so on, data can be entered (as either text, value, repeated characters or formulae), locations, columns, rows or the entire array can be formatted, and so on. The format command allows a location to be considered as a percentage, so that the value is multiplied by 100 before display, and has a percent sign immediately after it.

A round command allows the internal representation of numbers be changed to match the precision of the display, and like other calculators, calculation can be either manual or automatic, with row or column first.

Curiously, I was unable to find an equivalent to the replicate or copy commands found on most spreadsheet calcs. In practice, this didn't seem to be a problem, and the control-L trick could be used to get around it in many cases.

Functions available are: ABS, INT, SIN, COS, TAN, ATN, LN, LOG, EXP, SQR, SUM, MIN, MAX, AVG, MEAN, VAR, SD (standard deviation), COUNT, NPV (net present value). Interestingly, the arithmetic functions and the floating point math routines in this program were derived from MBASIC 5.1, so the accuracy will be the same, and interested users would have a chance of being able to read Execuplan files, since variable storage is in MBASIC format.

The documentation supplied with Execuplan was well organised, though it would have benefited from more screen diagrams or photos. There are two manuals, a reference guide and a primer. The latter contains a number of interesting examples from areas such as real estate and anthropology (anthropology?).

Accuchart

Accuchart is a plotting and charting system for printers which follow the Diablo protocols, and which have a bidirectional paper feed (such as a bidirectional forms tractor). There are six chart generation programs and a menu.

The programs will allow several types of charts to be generated: XY charts, pie charts, bar charts with either separate or joined bars, stacked bar charts and comparative bar charts.

For each type of chart, the program will ask a number of questions, such as the titles for the axes, maximum and minimum values, whether auto-scaling is required, and so on.

After this, the data can be entered, and once the last data item has been keyed, the system will ask if the printer is ready. Upon confirmation, the program will pause briefly, and then start plotting the appropriate chart.

During data entry, the system will periodically enter a review mode which allows revision and correction of values if required. The system requires entry of modified data when some values are negative, but this is quite simple to do.

The input can also be from a data file.

The stacked bar charts are printed with either empty space or two different directions of diagonal or horizontal shading to distinguish the different zones. Comparative bar charts show groups of bars, again following the same shading procedure.

The resulting charts are neat and clean, although there are a couple of areas where the results are less than perfect. For example, the use of auto-scaling can result in awkward values against tick marks on the axes, instead of round numbers like 50, 100 and so on. Also, the resolution of the printer makes diagonal lines and curves rather rough (although a lot better than I could draw free-hand!).

The System

The Vector Graphic System 3005 compares very favourably with other small business systems. With its 5 Mbyte Winchester, there are no problems with mass storage and backup is easy using the tape cartridge drive with the 'UPLOAD' and 'DOWNLOAD' programs supplied.

The operating system is CP/M, the BASIC is Microsoft, presenting no surprises, but thereafter, Vector has elected to develop its own proprietary software such as Memorite and Execuplan. This would seem to indicate a higher degree of interaction between the programs and the hardware, particularly in the case of the Flashwriter II memory-mapped video display.

Incidentally, on the demonstration system there were a few games to demonstrate the ability of the video display — amongst them an excellent Space Invaders game. It is unusual to see this kind of software on such a powerful business system.

All in all, it's a good, versatile system. For users with different requirements, there are other systems in the Vector range, up to multi-user systems based on the same basic hardware.

The Turbocharged IMS

WHEN IMS first came to my attention a few years back it was as a supplier of RAM cards that worked, reliably, in almost any S-100 system. Soon its reputation grew as a manufacturer of quality engineered boards and, finally, systems.

For a couple of years now IMS has been represented in Australia by SI Microcomputers in Sydney. At first, the IMS machines were sold mainly to scientific and engineering users (who recognise good engineering) but in recent months, the systems have begun to carve a fair sized niche in the commercial world.

With this development in mind we took a look at the latest model from IMS, the 5000SX. This desk-top box packs in a selection of three 13cm floppy and Winchester drives, a 12-slot card cage and a beefy power supply.

The innards of the box reveal the same solid construction as ever. Although this cabinet is lighter than previous models, and has a tendency to flex when lifted by opposite corners, it is still tough enough for any office, while light enough for convenient movement. It also looks good, something that many S-100 system manufacturers find difficult to achieve.

In the card cage of our review model were a motherboard (reportedly tested at 8 MHz), Z-80A CPU at 4 MHz, 64K RAM card, floppy disk controller, Winchester disk controller and a serial I/O card. All are solidly locked in place and neatly cabled up.

The finish of the boards is very good indeed and they give the impression, from the pc board layout, of conservative design. The system performed flawlessly, after an initial problem which turned out to be a minor fault on my terminal, not the IMS box.

While many S-100 systems are integrated from several manufacturers' products, the tendency for IMS systems (and indeed the industry trend) is for the system to comprise a matched set of

boards. This has made it possible for IMS to link its software support to the hardware much more than some other manufacturers have done.

The primary operating system for IMS systems is CP/M. All IMS systems will support CP/M, regardless of the configuration in terms of disk drives and I/O ports. This is achieved through a number of interesting techniques.

For example, the first sector of the first track of a disk does not carry the bootstrap loader, as on most CP/M systems. Instead, it carries a Load Parameter Block, which is a table of data which defines the physical characteristics of the disk as well as the load address and length of the operating system.

Using this technique, it is possible for an IMS machine to boot off any drive in the system, usually the first drive to come ready.

The CP/M BIOS is written in Z-80 code, and is supplied as a library of linkable modules which can be combined to construct the required device drivers. It is entirely table driven, consisting of a Logical Unit Table which contains pointers to the various Logical Device Control Blocks which are the actual device drivers.

The system is configured by editing the main module to contain the desired module references, assembling it, and then linking it with the required modules from the libraries. This will automatically bring in the required interrupt drivers and initialisation routines at link time.

Apart from the sophisticated implementation of the BIOS, the CP/M system is completely standard. IMS also provides a number of utilities for formatting, copying, and sysgen-ing the various drives its systems support.

The TurboDOS Alternative

An alternative to CP/M for IMS owners is TurboDOS, an operating system which is written in Z-80 code and offers several advantages over CP/M. In fact, it is designed to replace MP/M and CP/Net, as it offers a networking system based on the same modules.

TurboDOS is compatible with CP/M 2.2 and the authors claim it can be used as a direct replacement for CP/M on any Z-80 based computer. As soon as I hear the word 'compatible' however, I am reminded of the computer industry saying that 'compatible' describes any items of equipment or software which require less than $1000 or 100 man-hours to get working together.

First the bad news.

TurboDOS does support most of the CP/M BDOS calls (except functions 24, 27, 31 and 40) and direct BIOS calls. The missing functions, which mainly relate to the disk allocation map and the physical disk info, are used by stat.com and other CP/M utilities which report on file and disk sizes. These programs, such as sorted directory utilities, will not run under TurboDOS.

The BIOS calls are translated back into BDOS calls to run under TurboDOS. This means that programs which use BIOS calls for speed will in fact run slower under TurboDOS than CP/M.

Another problem on single-user systems is that TurboDOS is bigger than CP/M, so that a smaller TPA (transient program area) is available than under CP/M. This means that some large programs, such as Whitesmith's C Compiler, or Milestone, will not run. However, this is not a problem on networked systems, as the network slaves do not incorporate much of the OS, allowing a much larger TPA.

And, of course, there will inevitably be a few funny (and often inexplicable) phurphies with languages and utilities which use tricky code or rely on 'undocumented features' of CP/M.

So much for the bad news. If you can live with these drawbacks, and many happy TurboDOS users seem to be able to, then there are significant advantages to this OS.

First, there is speed. Because it uses Z-80 code, TurboDOS achieves a speed improvement over CP/M. This is further increased by the way TurboDOS utilises the disks — with large sector sizes, no skew and no reserved system tracks.

TurboDOS will automatically determine whether a disk is written in CP/M or TurboDOS format; in fact the two are not so very different. There are no reserved system tracks on a TurboDOS disk.

Instead, the system is contained in a file called OSMASTER.SYS and is loaded by a program called OSLOAD.COM. Like MP/M, the system is permanently resident in memory, and there is no reload on warm start.

The directory is slightly differently organised from CP/M. The first section of the directory area on disk is occupied by a volume name and the disk allocation map.

Specifications and Report Card

Unit:	IMS 5000SX
Made By:	Industrial Micro Systems Inc.
Processor:	Z-80A
Clock Speed:	4 MHz
RAM:	64K
ROM:	boot only
I/O:	two serial channels, Centronics parallel
Languages:	BASIC, COBOL, Pascal, C, P/L and probably Swahili to boot
Keyboard:	N/A
Display:	external serial terminal
Graphics:	N/A
Peripherals:	N/A
Expansion:	S-100
Best Points:	Beautiful construction
Worst Points:	Jargony documentation

Ratings:	**excellent**	**very good**	**good**	**poor**
Documentation:			✓	
Ease of Use:		✓		
Functionality	✓			
Support:	✓			
Value-for-money:		✓		

Review Unit from: SI Microcomputers, 3rd floor, 107 Walker St, North Sydney 2060. Tel (02) 922 3977.

This map is continually updated by TurboDOS on the disk, rather than in memory as CP/M does. This means disks can be exchanged at any time without having to reset the allocation map, a feature which eases the transition to multi-user systems.

If TurboDOS detects a CP/M format disk, it automatically relocates the first entries in the directory in order to put its allocation map in place (the volume name and map appear to be erased files to a CP/M system). Under certain conditions, however, it is possible for the map to get 'out of sync' with the actual disk surface, in which case a program called FIXMAP can be run to sort things out.

The operating system is actually supplied as a collection of relocatable, linkable modules, which are combined to construct the appropriate level of system. This is done with a special purpose linker called GEN.

Through this procedure, it is possible to build a number of different levels of system, from single-tasking, to spooling, multi-tasking and networking. Using this modular scheme, the physical device driver portion of the OS is linked in at GEN time.

Using 'BDOS function numbers' above 83 (to avoid contention with CP/M and MP/M), TurboDOS offers the ability to manage much more of the physical resources of a system. For example, communications channel control is handled through TurboDOS, where CP/M knows nothing about modems or serial ports. This makes communications programs and the like much more transportable.

Other facilities provided include a real-time clock with calendar, a selection of printer drivers (including XON-XOFF and NEC Spinwriter drivers), network drivers, record locking on files and drives, print spooling and password protection at log-on.

Record locking is achieved under high-level languages such as BASIC through the use of a 'fictitious' file called $.LOK. By reading and writing this 'file', applications programs can signal their intention to use the interlocks on shared files. This mechanism is sufficiently general that it is useable with almost all high-level languages.

Files can have several attributes, which are indicated by setting the most significant bits in the appropriate bytes of the filename (which is why PIP should not be used to transfer files — it will lose the attribute information).

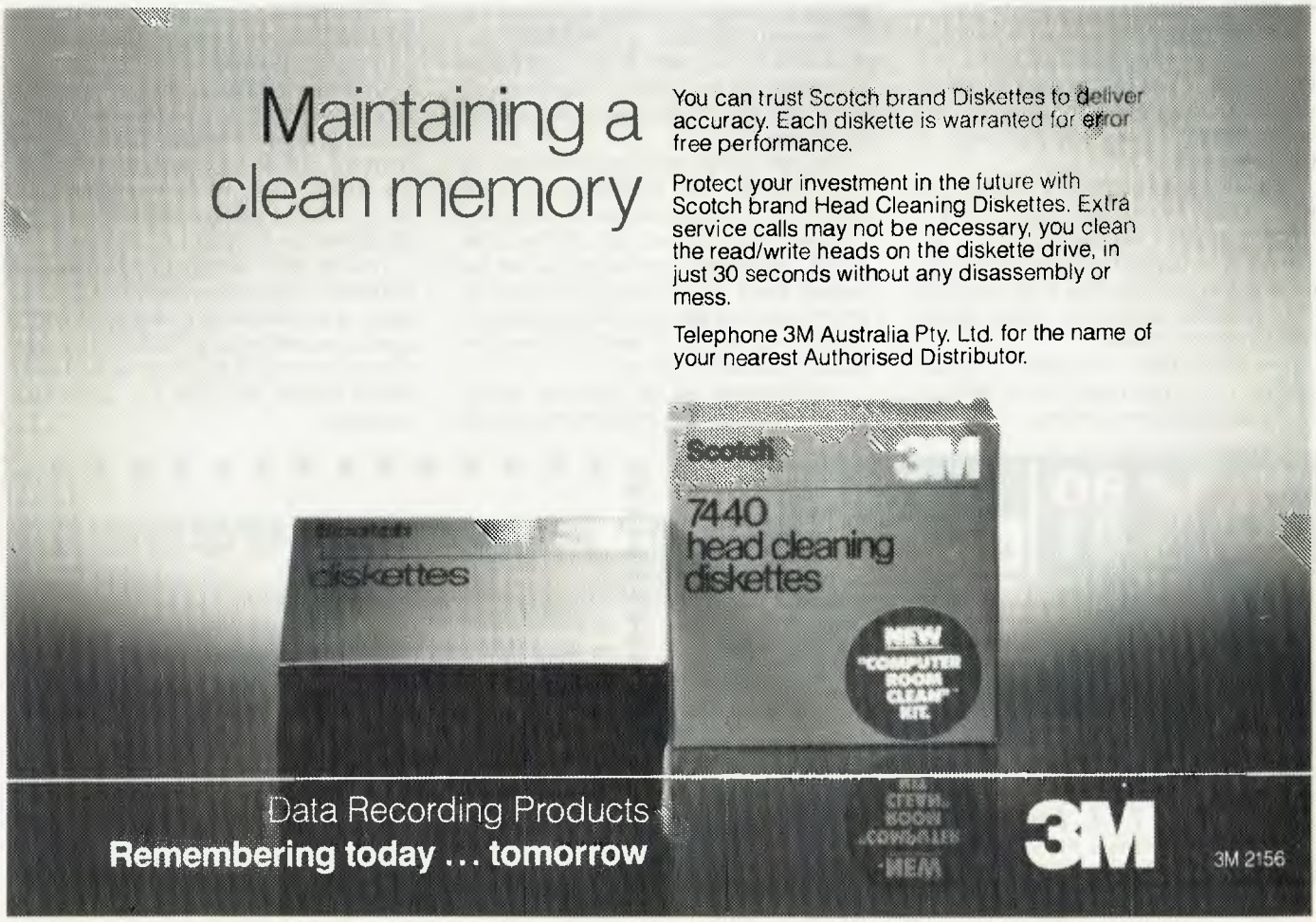
These include exclusive (only one process at a time can access), shared (may be accessed by concurrent processes), archived (used primarily in backing up Winchesters) and global (accessible from any user number).

The FIFO attribute indicates that files will be written and read in a special way, rather similar to a pipe in UNIX. Records will be written on to the end, and read from the beginning by two different processes (allowing inter-process communication). The header record of a FIFO will indicate whether the body of the FIFO is on disk or in memory (disk FIFOs are slow but can be large, while RAM FIFOs are fast but limited to 127 records at best).

The TurboDOS utilities have a number of interesting features. For example, they mostly have built-in wildcard expansion of filenames, with optional confirmation that indicated files should be processed. To avoid confusion with CP/M utilities, they are named differently; the equivalent of PIP is COPY, for example.

The documentation for both TurboDOS and the IMS hardware and software are pretty hard going and are not intended for the complete novice. IMS, in particular, has a tendency to jargon, particularly in naming programs like C48T096.COM, FMTF5B.COM and similar.

TurboDOS is certainly fast in operation, and seems much more sophisticated than CP/M. When expanded to a network, one can see that there would be obvious advantages to it over CP/M. The IMS hardware is well set up to support such a sophisticated software system; it represents close to state-of-the-art, coupled with conservative construction. □



Son of IBM Rides Again

THE Computer Company formally launched the Panasonic JB3000 personal computer with a multi-media kaleidoscopic presentation on June 29. Readers will recall from our write-up a couple of months back that the JB3000 is software compatible with the IBM Personal Computer.

With the arrival of the first machines in the country (though you won't see them in the stores yet), we had a chance to take a closer look and to investigate that compatibility.

The JB3000 is quite small. The keyboard is lighter than the IBM's, and doesn't have its unusual feel, but is very comfortable and easy to use, with an enlarged 'lower lip' on which one can rest the heel of the hand.

Inside the machine the construction is up to the usual Panasonic standards. The main board is beautifully made, and there is room inside the system box for up to three expansion cards.

Compatibility point one — there is no empty socket beside the processor for the Intel 8087 arithmetic co-processor unit. This is unlikely to affect many users, especially for the next year or so, as the price of the 8087 is still around the $500 mark.

Still, for those interested in number-crunching, the 8087 will be a definite plus for the IBM. Maybe by the time production units reach Australia, the board will have been redesigned — the Japanese do things like that.

The other area of difficulty is in the hardware design of the video circuitry. Evidently this does not work in exactly the same way as the IBM (it has more colours, for example), so machine code programs which directly access the video display will run into difficulties.

The IBM version of Visicalc, for example, will not run correctly on the JB-3000 as the display driver is wrong.

It seems quite probable that other machine code programs, particularly games, will suffer from this problem too.

At a higher level in the software hierarchy, BASIC programs will be completely compatible.

When I saw a production prototype, the BASIC interpreter was just plain MBASIC-86 with machine code subroutine calls to drive the graphics and music. By the time of the release, TCC had received the Panasonic version of BASICA, the Microsoft BASIC with high-res graphics and music drivers built in; programs written for this should work identically on both machines.

Recent reports claiming the Panasonic is much slower than the IBM because the IBM runs a compiled version of BASIC are incorrect; they both run virtually the same BASIC interpreter, and as far as we are aware, there is no BASIC compiler for either machine yet, with the exception of CBASIC-86 which is partially compiled and runs under CP/M-86.

Unfortunately we did not have an opportunity to run our benchmarks on the Panasonic machine, but see no reason to believe it would be any slower than the IBM as both have the same clock speed.The display on the JB3000 is capable of quite dramatic colour, though we are unsure how much of this is due to the quality of the monitor or the video generator circuitry. Certainly the colours were much better than on any personal computer we have seen.

TCC has also released details of the 'Attache' business software which will be sold for the JB-3000.

Modules available include Debtors, Creditors, General Ledger, Stock, and Invoicing/Sales Analysis. Each attache-case box contains the software, manuals, pre-printed stationery to get started and a voucher for a training course at Metropolitan Computer College.

The JB-3000 will be sold by Angus & Robertson bookstores, Myers Melbourne store, and independent dealers. A typical system consisting of a 128K CPU, monochrome display, 2 minifloppies and a dot matrix printer will retail for $5998 plus sales tax.

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Buying Computers

I AM interested in purchasing a personal computer and I am wondering if you can throw some light on the subject.

I am a beginner in BASIC but I do not want a system that will be limited after I have mastered the language. Also, what about availabity of software as after reading your item about the TRS-80 Colour System are 'games and simple applications' available only? My price is limited to around $1000.

On a different note; I am from New Zealand on a working holiday but I am now thinking of settling down in a job permanently. The job? A computer programmer.

How on earth does one begin? I have worked in a bank for eighteen months and about ten of these months was in computer input.

Unfortunately the systems we used were NCR encoding machines, so I guess this experience is not too important. Does one have to go to a Technical Institute to learn or are there oportunities to start work in a firm operating with computers?

I have had my eye on the papers for some time now and all the firms seem to want people with a minimum of 2 to 3 years experience.

I have heard of places where you pay and they teach you — is this true? Any information on these subjects would be greatly appreciated.

D WHITESIDE
Kununurra, WA

Really, I can't advise you on which computer to buy; that's a value judgement which depends as much on what you want as what the various computers offer.

On a general note, it is always true that when a new computer is released there is a lack of software for it; I wouldn't single out the TRS-80 Colour Computer in that regard — there are many worse machines.

As far as getting training for a job as a programmer: there is a world of difference between hobby computing and the real world where jobs are bigger and have deadlines attached (not to mention documentation to write).

The best way to start is with a college course — I haven't tried any of the commercial courses so I can't comment at this stage. Perhaps those of our readers who have been through Control Data, MCC or similar courses might like to give us their opinions?

Coding The 6502

I AM A fourth form student who has a basic knowledge of the BASIC language. At present I am looking for a comprehensive manual for the complete novice in machine language programming for 6502-based computer systems.

Although we don't have a computer at home, at school we do have two Apple IIs as will as two terminals connected to a PDP-II and through TASNET to Vax in Hobart. So if reference to a computer is needed; Apple II.

Please note I wouldn't know a 'peek' from a 'poke' or a memory map from a circuit plan so a book on machine language will have to be very comprehensive.

WAYNE BESWICK
Preolenna, Tas

Machine Language Programming on the Apple by Don & Curt Inman is probably the best all-round machine-code programming book for the Apple and indeed other 6502 machines. There are a number of other good books around, particularly Assembly Language Programming for the 6502 by Lance Leventhal, in the Osborne/mcGraw Hill series of books.

Super-80 Software

I HAVE recently bought a Super-80 computer, only to hear that there is no software available. Could you please find out if this is true, also could you start a Super-80 section, as this machine is getting popular by the minute.

Could you please write a program suiting the Super-80, if possible.

GARRY BLACK
Geelong, Vic

There must be somebody out there who's written something for the Super-80! Send it in...

Unfortunately I'm not in a position to write software for the Super-80 — I don't have one and, more significantly, it takes me 27 hours a day to write the software I DO have to write on my own machine!

Talking Robots

I RECENTLY purchased a copy of the Robot Attack game (Hogue & Konyu) reviewed in *Your Computer* (January, 1982).

It was described in its documentation as a 'talking' arcade game. I hooked the sound output lead from the System-80 to my stereo amplifier and although it produced some interesting sound effects, there was no voice as such.

However, when I connected my computer to a telephone amplifier (Dick Smith, $12.50) it spoke! The program speaks such lines as 'Game over player one' and of course announces 'Robot Attack'!

I now have two questions: Why didn't the review mention this program can talk and how is this 'voice' possible on a TRS 80/system-80 without a speech synthesizer?

SCOTT O'KEEFE
Burraneer, NSW

Ummm — the hard one first. The reason I didn't mention the game could talk is that I never quite managed to get my tape recorder and computer to work together to try it, and when I came to write the game up, I clean forgot about it! Anyway, you're right, it does talk, and we're happy to let everyone know about it.

How does it do it? Well, without knowing the actual program I can't say for sure, but it probably uses a simple digitising technique known as 'Delta Modulation'. This only requires the addition of a resistor and capacitor to a single bit of an output port to produce sound effects, and since that's the way the Tandy drives its cassette interface anyway, it's easy to do.

For further details on this technique, see an article by Phil Mork in the reprinted Volume 2 of Dr. Dobbs Journal of Tiny BASIC Computer Calisthenics and Orthodontia. Alternatively, if I can find the time, I'll write an article on how to do it(...?).

OS-9 - Power For Your Peach

Motorola's 6809 microprocessor has given new life to aging 6800 systems, as well as making possible such machines as the TRS-80 Color Computer and the Hitachi Peach. Les Bell reports on one of the most powerful software packages for the 6809...

your computer

SOFTWARE REVIEW

WHEN MOTOROLA first introduced the M6800 microprocessor, back in 1975, I worked with one of its first EXORcisor development systems. Software support back in those days was crude, to put it kindly.

There was a line-oriented text editor and an assembler, both loaded off paper tape — and, horror of horrors, they both lived in the same area of memory, so that the editor had to be reloaded after an unsuccessful assembly.

We've come a long way in both hardware and software tools since then. Motorola's successor to the 6800, the 6809, is very much more powerful, not to mention easier to program. More importantly (and due to hobbyists who refused to believe it couldn't be done), we now have operating systems and high level languages for many microprocessors.

OS-9 represents the 'state of the art' in microcomputer operating systems. There are two versions — Level 1 is for systems as small as 4K of ROM and 2K up to 56K of RAM, while Level 2 is for systems with up to 1 Mbyte of RAM and memory management circuitry. As far as the user is concerned, however, the two systems are almost identical.

OS-9 is loosely modelled on the UNIX operating system developed by Bell Labs (no relation, unfortunately). However, UNIX is designed for rather more powerful processors (PDP-11s up to IBM 370s), and in particular for systems with high-speed mass storage devices (disks).

UNIX makes a little memory go a long way by temporarily writing segments of memory out to disk, freeing that space up for re-use, and then restoring the original contents when required (this is called paging or virtual memory). You are welcome to try this with a floppy disk!

OS-9, on the other hand, keeps all running programs in memory all the time, a sensible approach under the circumstances. In addition, while UNIX is written in the C programming language, OS-9 is written in assembly language to squeeze the last drop of performance out of the microprocessor — although it does support a C compiler.

The system supports multi-programming, allowing several users on the machine simultaneously. It does this by allowing a real-time clock to periodically interrupt the task under execution and jump to the operating system, resuming with the next task.

In fact, a single user may run several programs simultaneously, so that long programs need not tie up the system. Input/output may occur simultaneously with running programs, so that the system allows 'type-ahead', catching up with the user when it has a chance.

OS-9 programs are modular — that is, they consist of separately written and assembled modules which are linked together at run time. Memory is managed in much the same way as a disk, with a module directory which contains information on each module in memory, including its address, size, and so on. The module directory can include modules in ROM.

This feature allows easy updating of programs by simply replacing modules with no concern about size or location of patches. The new module is simply entered in the directory and the update is complete. This is particularly useful for updating ROMs.

Like UNIX, OS-9 supports a hierarchical file structure. In other words, each user can create new directories for each project, group or any reason, in order to group related programs in their own directory. Directories can contain subdirectories, so that a file is specified by a pathname specifying each of the directories, down the 'tree' in which it appears, followed by the filename itself.

Again borrowing from UNIX, I/O devices are treated as though they are data files, simply an unstructured series of bytes upon which other levels of structure can be superimposed by the user program. This concept means that, to the user, all I/O devices look the same, allowing redirectable I/O, another major feature of both UNIX and OS-9.

Using redirectable I/O, a C program, for example, is written to take its input from the standard input stream (the console), and its output goes to **stdout** (again, the console). At run time, the operating system can switch the input and output from and to any other devices.

For example, a program that simply echoes its input back to its output (dumb!) becomes useful if its input is directed from a disk file and its output directed to a printer. That's the CP/M Ctrl-P TYPE command and one of PIP's functions, to boot. Add automatic pagination and page numbering, and it becomes a really useful tool.

The outer level of OS-9 is the 'shell', a command line interpreter which allows system commands to be typed in and executed. It is the shell that examines input lines and decides what you mean by a line like:

```
update < master—file ! sort ! write—report
> /p ; del temp
```

Come to think of it, what do you mean by a line like that?

There are several symbols which have special meanings on the OS-9 command line. First, there is the / symbol, which is used to delimit directory and file names in pathnames. For example, the pathname:

```
/D1/project1/backups/analyse
```

would specify file analyse in directory backups in directory project1 on disk drive D1.

Several symbols are used to specify I/O redirection: a less-than symbol redirects the standard input path, a greater-than symbol redirects the standard output path, and a pair of greater-than symbols redirects the standard error output path. Thus the command line:

```
DIR > /D1/listdir
```

would perform a directory listing operation on the current directory, but instead of directing its output to the screen, it will send it to the file listdir on drive 1.

It gets even better. Multiple commands can be chained together on one line, separated by by semicolons. So the line:

```
COPY curprog /D1/project1/myprog ;
DIR /D1/project1
```

would copy the file indicated on to disk 1 in the pathname specified, and then do a directory of project1 to confirm the file had in fact been transferred.

There's more. Commands on a line can be separated with ampersands (&), in which case they will execute concurrently, not sequentially. This is how command lines specify multi-tasking, allowing several jobs to be done at the same time.

Finally, the OS-9 shell (optionally on Level One) supports pipelines. A pipeline consists of two or more programs, the input and output paths of which connect to each other, not to devices or files. The pipes between programs synchronise the input and output paths, allowing programs to communicate while they execute concurrently.

The pipeline separator, !, must always be followed by a program name. Thus the line given above runs program update with its input redirected from a path called master—file. Its output becomes the input for program sort, which in turn feeds its output to program write—report, which has its standard output redirected to the printer. Finally, once write—report has finished, the file temp will be deleted.

Since it is a multi-user system, OS-9 offers several options for file security. Each file has several attributes, including ownership, date and time created, date and time of last modification, and access permissions. There are six types of access permissions, each of which can be independently set or reset. They are write, read and execute, for both owner and public access.

Each user has a name and password which must be given to the system at logon.

Procedure Files

As far as the operating system is concerned, the shell is just another program, and the user can create multiple invocations of it as required. One particular use of this is the execution of procedure files.

If the user 'creates' another shell, with its standard input path redirected to a file, the new shell will accept and process command lines from the file instead of the console. This allows batch processing of lengthy command streams in background mode.

The shell is fairly smart in its awareness of file types. In the examples given so far, all the command programs have been machine code programs. However, the shell will also accept procedure files or BASIC09 files, automatically invoking BASIC09 in the latter case.

BASIC09 is a large programming system which seems to set out to be all things to all people. To its credit it seems to come close.

While including the ANSI standard BASIC language, BASIC09 also manages to accept and run many Pascal programs with only minor modification. It includes a text editor, multi-pass compiler, run-time interpreter and interactive debugger.

Like much OS-9 software, BASIC09 is composed of reentrant modular code, so that only one copy of the program need exist in memory, although multiple tasks may use it. This helps considerably with memory space utilisation in small systems.

BASIC09 allows named procedures to be called by name with parameters. Variables and line numbers are local to procedures, and line numbers are optional in any case.

Five predefined data types are provided: byte, integer, real, boolean and string. From these, the user can create complex structures and data types which may be passed as parameters, assigned, stored and loaded as single entities.

Control structures include repeat..until, while..do..endwhile, loop..endloop, exitif..then..endexit, as well as the more common if..then..else..endif and for..next loops.

Precision is 40 bit floating point (9 decimal digits), and a full set of transcendentals is built into the language.

The OS-9 shell can be called from within a BASIC09 program, allowing any of the operating system facilities to be used.

Documentation

The manuals supplied with OS-9 are comprehensive and well written. The user's manual is pitched fairly non-technically, though prior experience with other operating systems will obviously help the learning experience.

The system programmer's manual is much more detailed, and provides information on all the operating system calls and considerable detail on its internal operation. This is primarily a reference manual, although programmers will generally have to read it through before setting pencil to paper.

The BASC09 manual combines both functions. Although it starts with a general introduction to programming, the latter section of the book is organised for reference and provides a complete and formal description of the language rather after the style of Pascal.

OS-9 is supplied as a firmware module and disk software. It can run on almost any 6809-based system, although I saw it running on a Fairlight Quasar and Hitachi Peach systems. On the Quasar it was able to support three tasks simultaneously without appreciable system overhead.

The OS-9 firmware module for the Peach costs $585 from Integrated Information Systems (whom we also thank for its assistance with this article). For further details contact Integrated Information Systems, PO Box 168, Round Corner, 2158 or telephone (02) 651 1145 or (02) 848 0800. □

Specifications and Report Card

Programme:	OS-9 Operating System			
Made By:	Microware			
Useful for:	General Software Development and Operation			
Hardware Req'd:	6809 Processor, 4K ROM 2K RAM but sensibly 56K RAM & Disk Drives			
Ratings:	**excellent**	**very good**	**good**	**poor**
Documentation:		✓		
Ease of Use:		✓		
Functionality	✓			
Support:		✓		
Value-for-money:		✓		
Extras Included:	BASIC09 BASIC Language			
Options:	COBOL compiler, C compiler, System Word Processing, Database Management System			
Price:	$585			
Review Copy from:	Integrated Information Systems			

And Another One...

The FLEXible Operating System

By Alan Fowler

JUST AS CP/M is the most popular disk operating system for the 8080 and Z80 families of microcomputers, so FLEX is the operating system for the 6800 and 6809. Although it's been around for many years, you will seldom see it mentioned outside of the specialist 6800 magazines.

FLEX is a friendly system, and as flexible as its name implies. You can run it on a system having from one to four drives, with any mixture of single or double sided, single or double density 13cm or 20cm soft-sectored floppies or hard disks, as long as there are no more than 255 tracks each with up to 255 sectors of 256 bytes on each side of each disk (that's about 16 megabytes each side).

I haven't tried it, but I suspect you could even run it on a tape system, although a suitable transport would cost more than a floppy disk. With a double density disk controller, you can use single or double density disks in the same disk drive. You can even use both single and double density tracks on the same disk — FLEX takes it all in its stride.

You can use it on nearly any 6800 or 6809 based system with at least one soft-sectored floppy drive, and a disk controller that lets you use 256 byte sectors.

You can use it on an Apple, with a Soft-Card, and you can even use it on the S-100 bus.

Floppy Disks

The floppy disk is one of the most commonly used methods of storing programs and data. They come in two sizes, the 133 mm (or 5 1/4 inch) and the 200 mm (8 inch). Information can be stored on either one or both sides of the disk. It is stored on one of a number of concentric tracks which are broken up into sectors.

In the case of FLEX these sectors are each 256 bytes long, and there are ten sectors on each track of a 133 mm disk. A 133 mm disk usually has at either 35 or 40 tracks available, although some of the newer drives allow 80 half width tracks on each side. A 40 track, single sided disk will therefore have a capacity of 400 sectors, or about 100 K bytes. A double sided 200 mm disk will have a capacity of about 4000 sectors, or roughly a million bytes of information.

With all this space, how can you ever find the program or data you need? In the more primitive systems, you had to keep track of this yourself — you decided where to write on the disk, and kept all your own records. You needed a very tidy mind, and a strong will to make sure you wrote all the information down each time anything was changed on the disk. As well as knowing the starting address of each file you had to know the length, and if you wanted to add extra information onto the file you needed some way to link it all together.

All in all, it became a very messy and time consuming problem, and took much of the fun out of using a computer. What was really needed was a program to do all this clerical work for you.

This is exactly what a disk operating system is. Its a program which keeps a list of all the files on the disk, where they are located, and how long they are. It may also keep such other information as the creation date of the file, the date of the last access, and any special attributes.

Files can be addressed by name, and the operating system will read them into memory, or write them out to the disk as required. It will also keep track of how much free space is available on the disk and where it is located.

If this was all a disk operating system did, it would be worthwhile. A good system does much more, and in fact it becomes a super monitor with a rich collection of the most commonly used subroutines. This makes it very easy to write special programs with a minimum of effort.

Using FLEX

Depending on the system, FLEX is automatically loaded from disk and run following power-on, or is called up, loaded and run under the control of the monitor.

FLEX prints a sign-on message, and asks you to enter the date, unless the system has a built-in calendar. It then searches the directory of the disk in drive 0 (FLEX calls the drives 0 to 3) for a file called STARTUP.TXT. This is a text file containing a number of instructions to initialise the system to suit your requirements.

The STARTUP file must contain only a single line, which typically looks like this:

```
ASN S=0 W=1: TTYSET WD=80 DP=65
TB=2F:DATE:ASN
```

This line contains four executable commands. The first assigns drive 0 as the system drive and drive 1 as the working drive. These are the drives that are selected if you don't specify a particular drive at any time.

The second sets the Teletype, or VDU parameters, as 80 to the line, 65 lines per page and the tab character as '/' (hex 2F). The third prints out the date to make sure you entered it properly, or that the system calandar is not running slow. The last one prints out a reminder of the default settings for the drives.

Following this, or if there is no STARTUP file present, FLEX prints the prompt '+++'. Any time this prompt is printed, it is safe to remove, insert or change any disk. Unlike some other systems, it is not necessary to tell FLEX that a new disk is present.

FLEX filenames may be up to eight characters long. The first must be a letter, but the remainder can be any mixture of letters, numbers, hyphens or underscores. The letters can be either upper or lower case. FLEX has a flag which may be set to treat names having upper case letters as either different to, or the same as, those having lower case letters.

The name must be followed by an extension of up to three characters. The first must be a letter, and the remainder as for the name.

FLEX has a number of file extensions that have special meanings. For instance, the STARTUP file has the extension .TXT, because it is a text file containing only printable ASCII characters. The three names listed in the STARTUP file, ASN, TTYSET & DATE are all command files and have the extension .CMD. Other extensions are .BAS for BASIC programs, .DAT for data files and .BIN for binary, or machine language files.

Its not necessary to use a RUN command in FLEX — just type in the name of the command file and hit RETURN. FLEX will always search for a .CMD file on the system drive, and most other types of file

in the working drive. Remember, these were set to drive 0 and drive 1 respectively by the ASN command in the STARTUP file.

If the command file is not on the diskette in the system drive, it's only necessary to put the drive number before or after the file name and separate it with a full stop; for example, 1.TTYSET or ASN.3 for drive 1 or drive 3 respectively.

Built-in Commands

FLEX has only two built-in commands, GET and MON. GET loads a binary file into memory at the address specified in the file, and then returns to FLEX. MON transfers control to the normal system monitor so you can set breakpoints, run the program and carry out other tests.

Two built-in commands might not seem enough, but every extra command takes up valuable memory space. The designers of FLEX decided to leave as much free space as possible, and have put the other commands on disk. It's one of those choices the designer has to make; execution speed or free memory.

Utility Commands

FLEX is usually supplied with about twenty-five utility commands — the exact number and type will depend on which version you buy. Some of these commands have already been mentioned (ASN, DATE and TTYSET). Some of the more commonly used ones are:

CAT — lists the catalogue of files on a disk. If you enter CAT then RETURN it will list all the files on the working drive. You can enter CAT.0 to list the names of all the files on drive 0. Incidentally, wherever a comma is used as a separator in FLEX, you may use a space instead. To list a catalogue of all the files starting with A,J or L on drive 3, enter CAT,3,A,J,L then RETURN. To find all the text files with names starting with PLOT, enter CAT,PLOT,TXT and RETURN.

COPY — is used to copy one file, some files, or all files from one disk to another. Entering COPY,0.ASN.CMD,1.ASN.CMD will copy the command file ASN from drive 0 to drive 1. However, COPY,0,1,ASN.CMD will copy all command files whose name begins with ASN from drive 0 to drive 1. In fact, the 'wild card' matching follows the same rules as for the CAT command.

DELETE — will delete one or more files at a time. It is necessary to give the filename in full, with the extension. FLEX will ask if you want to delete the file, and give both the drive number and the extension to make sure it is the right one.

EXEC — lets you run a whole series of commands stored on disk in a text file. You could, for instance, tell it to format a new disk, then copy all or selected commands to it. You could tell it to run a text file through the text processor, then print out 27 copies. It is very handy if you want to leave the computer something to do while you go off to lunch.

LINK — FLEX doesn't have to live on a particular track on the disk. It is exactly the same as any other binary or command file, except that it has the extension .SYS to mark it as a system file. The LINK utility is used to automatically find the track and sector number of the start of the FLEX.SYS file, and put these into the boot program.

LINK can be used to link any disk file to the boot program, so that if you want the system to load some other machine code program which doesn't need FLEX, and then run it, it is a simple matter to do so.

O — the O command (not zero) puts the output to a disk file, generally with the extension .OUT, instead of to the terminal. Its main use is with the PRINT command.

PRINT — is much more than its name suggests, and is one of the most useful features of FLEX. Suppose you have just finished writing the first three parts of an article, and you want to print these out, but you also want to get onto the fourth part while its still fresh in your mind. Simple: use the PRINT command.

No matter how fast you can type, the computer is going to spend a lot of time chewing the end of its pencil while it waits for you. And while you are thinking up those clever phrases it might just as well go to sleep.

This is where PRINT comes in. It's really a printer spooler, and each time it is called it puts the name of the file to be printed into a queue. Whenever the processor has a few cycles to wait, it sends the next character or group of characters to the printer. If the printer is not turned on, it goes back to your other program, and keeps checking.

Other Commands

There is a wide range of other commands available to run under FLEX. Some of these are supplied as a separate utility package, some are available from various magazines, some are available from a range of suppliers and some you write yourself. That's another of the nice things about FLEX — it's very easy to write your own utilities and get them running because of the wealth of subroutines available.

Most of the utilities are less than 1K; in fact, the system disk I am using at the moment, 133mm single density, double sided, contains one hundred and twenty commands, and still has room left. For instance, BASIC is a command file, and takes up about 18K. There is also a text editor, a word processor, several assemblers and disassemblers and a whole series of memory and diskette tests.

Depending on the package you buy, the editor may be included or sold separately. The usual editor is line orientated, and makes no assumptions about the terminal, other than that it's a teletype or a dumb VDU. This is not intended to belittle it in any way — it's one of the fastest and easiest editors I've seen.

You can replace lines, move lines, delete lines and copy lines. You can restrict the search or changes to a block of lines or between two columns, where a 'column' is the character position from the start of a line. You can insert text between two lines, append text starting at a particular column and even overlay text. This latter is a cross between a screen editor and a self-correcting typewriter. When used with a VDU at 2400 Bits/second or faster, it's just about equivalent to a screen editor and a memory mapped VDU. After all, there are limits to how fast you can enter or read data.

The FLEX Assembler

Like the editor, this may come as part of the package, or as a separate item. The TSC 6809 assembler is a full macro assembler with conditional assembly. The source code is prepared as a text file using the editor.

The output is a binary file which is written to disk. The default extension is .BIN, but this can be set to .CMD to make the file a command file without further processing. There are twelve options that can be used in any combination to do almost anything you want.

One of the most useful combinations is 'BLS', which tells the assembler to suppress the production of the binary file, the program listing and the symbol table. And what, you might ask, is left after this? Only the error messages and warnings together with the lines where it has found a problem, or happily a message saying there were no errors detected.

The assembler is a two-pass assembler, and is fast.It can handle programs which are too big to fit into memory all at once. It calls in a block, works on that, calls in the next block, works on that and so on.

The only limitation is that there must be enough room in memory for the symbol table.

The assembler follows standard Motorola practice, so that it is easy to assemble source code prepared on another system. It includes a number of options that produce a more useful listing. The 6809 version will also accept source code for the 6800, and will assemble these to run correctly on the 6809. This is the simplest way to move existing 6800 software across to a 6809-based system.

Commodore Comment—And Conversion

By Peter Sandys

COMMODORE has been going through a big change in its direction. The old mainstay, the PET 2001, and its variations appear to be on the way out.

Software houses like Visicorp (Personal Software) and Automated Simulations have all discontinued products for the PET.

More importantly, news from the United States is that Commodore has been pushing the VIC and the 8032. This has been evident in pricing policy — the 4032 is not much cheaper than an 8032. And there are a lot of expansion options now becoming available for the 8032, like the 64k memory and the 6809 processor.

And recently Commodore decided to develop an Apple copy. Yes, the Apple — the machine Commodore has been trying to tell everyone was not as good as the Pet.

Read any of its own user magazines and you will find reference to the inferiority of the Apple. Even Errol the Cat (*Your Computer's* PET columnist) was convinced. Is this, then, a backward step — or is Commodore pulling its head out of the sand?

So what does this change of direction mean for existing PET owners? Regrettably, if you are not an owner of the 'Fat 40' you are left behind and might as well stop reading at this point.

Fat Forty's Friend

I have just had a look at a new modification for this machine, which converts it from 16 to 32K.

So what, you say, that's only a few RAM chips and the knowledge of which address lines to change on the board. And it's more than likely your local Commodore dealer has already done this for a small cost — isn't that one of the reasons you bought the 4016 (with so many dealers doing this — and saying not to mention it as its a special favour — it's amazing Commodore can sell any 4032s at all).

But...with this modification you also get your 4016 (4032) converted to emulate the 8032. In fact, in some ways it is better than an 8032. How? Read on, McPET!

It was always only a matter of time before some enterprising electronics whizz worked out how to convert the Fat 40 to the 8032. Owners game enough to open their machines and look closely at the logic board might have noticed it was very similiar to the 8032.

The whizz was John Weegan, ex-treasurer of the NSW users' group (ex because he was not happy about Commodore's interference with the workings of the group and the way in which it took control of the club's own magazine).

John and Pat Geradis (also of the users' group), decided it was worthwhile to see if they could improve the 4016. With little outside help and many hours of work they came up with a workable conversion.

Apart from the logic problems John and Pat had to work out how to get the extra key functions that were on the 8032 onto the PET. They achieved this by adding a row of nine keys above the existing keyboard.

Those of you who know the differences between the two machines will be aware that there are actually only three extra keys — John and Pat decided why not add keys which utilise functions only available in the programming mode on the 8032. These keys and their functions are:

Repeat: By holding this key down you can repeat any key pressed.

Tab: The tab key means you can set a tab function or delete it if you use shift/tab.

Escape: This operates when the screen editor is in quote mode, or there are outstanding inserts. This key enables you to escape into normal mode. Those of you who have tried editing in quotes and just got a series of cursor symbols will know the value of this key.

The New Keys

All these keys are functions of the 8032 but are entered by using CHR$(x) values on the normal 8032. On the converted 4016/32 they are entered by pressing the built-in function keys:

Text: Selects text or graphic mode, similiar to the old poke 59468,12/14.

Scroll (up or down): With this key the cursor remains in place while you scroll text upwards or downwards.

Delete: Functions as line deletion, and insertion in shift mode.

Erase: Erase line right of cursor, or left in shift mode. Superb for those with disk drives. Move cursor to file you want to load on directory listing, move cursor over name and delete rest of line.

Window: Sets top and bottom of window in which you want to work.

Reset: This is the Jim Butterfield reset. By pressing this key with a hard reset switch on the side you can halt the execution of any program which has hung up your PET. You can use this in 40 or 80 column mode.

The only key not included in John's modification is the BELL key. Maybe he will include it later; since he has gone this far he might as well finish the job.

I was a little critical of the positioning of the keys; I felt they could have been placed lower, more convenient to the user — until John pointed out that it was not possible without a major modification, which would greatly increase the cost.

John showed me some 8032 programs to prove the system does actually work. These were Visicalc, Wordcraft, and Wordpro and some radio ham programs. I was satisfied that the conversion was successful.

Not only does John's modification (which, incidentally, is added onto the front of the existing logic board) give you an 8032, it can be changed by the use of a switch on the side to a 4016/32 and will act exactly as it did originally — any existing software you own is not obsolete (Space Invader freaks can relax). This is something the 8032 can't do without reverting to pokes.

Furthermore, John has added a sound unit and speaker control to the new board to enhance the use of sound.

So what is the cost, apart from the withdrawal symptoms of having to live without your PET while it's being converted?

The total conversion cost is less than $400, which means for a total cost of less than $1395 you can have an 8032 — retail value around $2400. You can contact John on (02) 747-6485. □

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SILVER NEC 512

LINTON-SIMPKINS

EVERY now and then the authorities in the Dominican Republic want to know how many Dominicans there are, so they have a census.

Now this doesn't mean a count of the members of the Order of Preachers — the repositories of orthodoxy within the Catholic church and the order that ran the Inquisition. It means the people who live on the other end of Hispaniola from Haiti.

Every now and then the Americans have to go into the Dominican Republic and save it for democracy and the United Fruit Company of the USA. This must not be confused with the way the Russians went into Afghanistan, as there the puppet government issued a forced invitation.

The Americans go into Dominica under something called the Monroe Doctrine, a piece of policy set by an ancient American president allowing the US to legally enter any nation in its hemisphere which looks like moving to disagree with Uncle Sam.

The Monroe Doctrine would be wholeheartedly accepted by the Dominican order of priests, because it rather mirrors their ways — as in the days, the great days of Torquwmanda and Savronrola when the Order of Preachers was often more powerful than mere kings or popes.

This year the Dominican Republic wants to know how many people it has to spend on its habitual conflict with Haiti and Baby Doc Duvalier. It must be hard for the US to pick which side to back with counter-insurgency arms and equipment as both nations are hardly democratic.

It seems US policy is always: if in doubt, back an entrenched dictatorship. In the case of the Hispaniola, Columbus' name for the island and one favoured by Horatio Hornblower, the Americans would have to toss a coin.

Getting With The Strength

But at least this year the Americans will know how many Dominicans there are, and this might help them to get with the strength.

Not only will the both governments know the population numbers, the heads will be counted using a Westinghouse Datascore System. Of course, if it had been in El Salvador that term counting of heads might literally be true.

In a contract worth $US550,000 Westinghouse has undertaken to supply a W201 scanner system, which is for the processing of data from a population census of the more than one million households on the tiny island.

The W201 scanner is a device to read pencil marks on paper and generate machine readable input for later processing.

Now in the mists of the past I can recall a device made by Hollerith, ICL's grandsire, that rejoiced in the name Hark-Sensing End-Printing Reproducer/Gangpunch. If my memory serves me well this device used three card columns to sense one character, and the sensing was done by the passage of a current through the graphite laid down by the marking pencil. Thus some 27 characters could be sensed on each card.

Later on Control Data (come on now, you remember Control Data?) had a device which could read specially typed text. It used a light source so intense that some operators sought to improve their suntans and others worried about producing mutant children. Neither group got what it wanted or feared.

Back in Hispaniola

Meanwhile, back in Hispaniola, Dominica and Haiti were working voodoo against one another and the Dominican government was distributing a 20-page census book which had to be filled out in one day.

Since the literacy level on the island is about the same level as that of Afrikaaner Police, one wonders at the quality of the source data. But then I always worry about the source data.

In addition to the W201, which doesn't rely on the passage of electricity through graphite on a card but some optical method, Westinghouse supplied a booklet slitter, equipment maintenance, technical consultation and personnel training in both Iowa and the city of Santo Domingo.

While this counting of heads is going on what is Baby Doc Duvalier doing down the other end of the island. Twiddling his thumbs? Twiddling someone else's thumbs with a pair of pliers? Or just taking the Tonton Macoutes out for a run after they have been couped up in the cages so long?

The answer is probably all of these activities. □

Let's Go Rowing...

IN THE field of sport the American blacks and the East Germans seem to split the wins, while the rest of us miss out.

No sport, however, is dominated by any nation in the way East Germany dominates men's heavyweight rowing. The East Germans have been unbeatable for about ten years, and this despite the fact that both Russia and Australia often have bigger crews (the less said about Russia's women rowers the better).

Second among the rowing nations in the heavyweight class is Britain, and its crews look like fairly skinny and pale individuals alongside our giants. But then they are very rarely alongside our crews, being mostly rather far in front.

The best theory to explain why those two nations do so well isn't that they have more rowers to pick from. It is that they can select and balance their crews better because they have on-board computers to check performance in action. We have to rely on out-of-the-boat physical test and observation: neither provides the accuracy of information really needed these days.

If you look at a racing rowing boat the thing that sticks in your mind, after noticing how thin the skin is, is the outriggers that carry the hinges (the correct term is gates) in which the oars turn.

The gates are about 60 centimetres out from the sides of the boats. Since the effort that drives the boat forward is transmitted through the gate, a strain gauge placed there would measure the effort each oarsman was putting out.

The system, and I am proposing that some benevolent micro specialist build one to assist the holy Mosman Rowing Club assume its rightful place at the head of all the rivers, would have to be able to measure the amount of effort applied to the gate at all times through the stroke for

each crewman — preferably by eight rowers at once.

The system would also have to measure the rolling of the boat and the impact, if any, on the end of the roller tracks as the oarsman came forward to start his stroke as this tends to slow the boat. At the end of the row the system would have to be capable of presenting the information in an acceptable way for the coach to make decisions such as where to place men in the boat.

A Truly Luxurious System

For a truly luxurious system the coach would be provided with any yawing details resulting from various strokes.

There is also the vital data about the time in each stroke when each oarsman starts his stroke and more importantly finishes it, in comparison with other crew members. This timing data could be picked up from the strain gauges in the outrigger gates.

Finally, the ultimate force component that drives the boat forward would also be needed. Selection of oarsmen would then become almost a science, as in East Germany, and we might start to win a few heavyweight rowing races. We already regularly win world championships in lightweight racing.

Now if the above doesn't represent a challenge to a skilled hobbyist, I don't know what does. Come on now, help the forces of good and brightness (Mosman) to overcome the dark menaces from other clubs so the editor can hold his head up in the bar at Mosman Bay (just down the hill from the old office of *Your Computer*); not that I've ever seen him there, mind you.

Now having made the abject pleas indicated on these occasions, it's time to tell potential programmers, system designers and such just what is involved.

The Workers Face Backwards

A rowing race takes place with the oarsmen, the workers, facing back the way they came and a coxswain or steersman facing towards the finishing line, which is from 1500 to 2000 metres away in serious racing.

Eights take up to 46 strokes a minute. Theoretically, the most efficient use of the oars would indicate that they sweep through an arc of 90 degrees — beginning 45 degrees ahead of the gateline and ending 45 degrees behind it.

The oarsmen can be up to two metres tall and weigh 100kg for heavyweight races. Such men swing an oar nearly four metres long with the hinge part about 1.2 metres out from the butt. The pressure on the gate at full power is therefore likely to be around 150kg, certainly more than their individual body weights.

This pressure will be greatest at the centre part of the stroke, when the oar is almost perpendicular to the sides of the boat, and least at each end. Strokes are made at an average of 38 per minute in a 2000 metre race, so for race evaluation the system has to be capable of storing the details of almost 250 strokes from eight oarsmen; hence it has to have the history of some 4000 individual strokes in its store for later evaluation.

All this equipment has to be about 4kg in total weight, and should be waterproof and salt resistant.

One more thing: the system has to be battery-powered as 2000 metres of cable would generate some considerable drag; besides, the other crews mightn't like the idea of possible electric shocks from the Mosman power supply.

From consultation with a few rowers, who incidentally view the proposed system in much the same way the Privacy Committee views lie detectors, the pressure gauges have to measure pressure from as much as 230 kg to as little as zero. The rolling sensors would have to read from 15 degrees to starboard and 15 degrees to port.

Mind you, the rowers have an exaggerated view of the rolling movement. From where I sit, in the normal acute discomfort of a rowing spectator area. the actual roll is less than 5 degrees; but it probably feels more.

Now what would be nice is some way of displaying to the cox which member of the crew was early, late or slacking, so admonitions could be roared over the in-boat PA system most clubs have fitted. It might possibly result in an increased frequency of early deaths among coxswains, but it also might result in more wins.

Let's Recap What We Want

We want to be able to measure the effort generated at all times during a stroke by each crew member up to 250 strokes. We want to be able to present a composite of each rower's performance throughout a 2000 metre race, measure the rolling movement of the boat and its frequency, measure its yaw movement during a stroke, and if possible, measure the boat speed and present it against the distance covered in each race.

The variations in timing of each oarsman against the average and if possible against distance covered would also be useful as some oarsmen get out of time as they become tired after the first 1500 metres.

Since boat speed would be a function of effort on the gate and water resistance, the measure of boat speed might be used to assist the designers of racing shells to improve their shapes.

Now this description of the problem of data capture and reduction in rowing racing is a markedly simplistic description of a very complex subject. However, the simple measurements are all functions of some more difficult to measure factors, so the resultant information would have significance; besides I had to make it simple, some readers may play cricket and one wouldn't want to make them feel their place. (I think he's knocking us, Greg!).

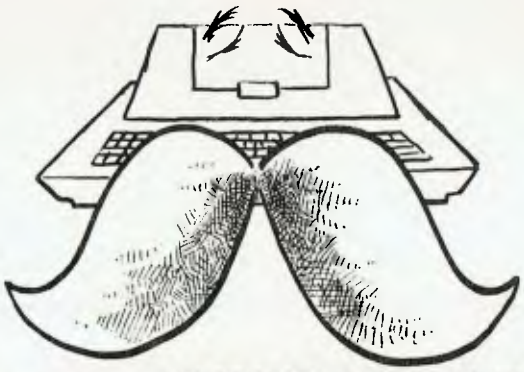
Perhaps A Disk Drive

Dare I suggest that a mini disk drive, or even a cassette to be processed later on a shore-mounted computer, might be able to do the work we want.

The strain gauges are already available for the gates, the rolling sensors could use some simple pendulum device, and the water speed could be measured by fitting a strain gauge on the boat's rudder. So get on with it, we'll need the system by the start of the next season in October.

All we really need is for someone to come up with a waterproof, battery powered micro offering 13 I/O channels.

It occurs to me that earlier I mentioned a display to allow the cox to tell if anyone of the crew was out of time. At 38 strokes per minute, each stroke would take 1500 odd milliseconds. That's a fearful long time to a computer: if an oarsman was one or two milliseconds late it wouldn't cause the boat any problems, but the computer might see it as a heinous crime, so some float would have to be programmed. □



At Home With Negus, The Atari

By Chris McEwan

MY INTEREST in desk-top computers began in 1976 when I fell in love with a Hewlett-Packard 9825 which winked at me.

Starting price for the HP 9825, however, was about $7000. It is still a fine machine, but I bought a Volkswagen Golf instead and went looking for a desk-top computer that fitted my budget (say, $2000).

Professionally I was thrown into the world of Univac and Honeywells, with an occasional, fleeting glimpse of the beloved HP 9825. Finally, the market turned out the machine that was worth waiting for — the Apple II.

The Applications

I sought a computer primarily for home use. The basic applications included, in descending order of importance:

- Graphing tables from the Australian Bureau of Statistics
- word processing
- hands-on experience of programming
- simulations and forecasting
- games

The basic specifications for the hardware included: high-resolution colour graphics; good memory size (I would settle for a 16K start, but would greedily go much higher); easy expandability; and availability of service.

The basic requirements for software are: popular; useful; easy to use; easy to maintain and upgrade; and access to advice (preferably from the vendor, but a user group can be a valuable support).

The Apple II plus meT most of the requirements, so I budgetted 7K9 Apple III out of our 1983 budget (I told you I'm greedy for memory).

Then came the crisis of 1982. My wife wants to learn computing. The demand for computer courses in Canberra is so great that, in four attempts, we utterly failed to have her enrolled. The choice lay between living with a fretful wife (she really is one of the nicest ladies you'll meet) or buying a cheaper, non-Apple machine.

A quick chat with the local finance people settled the issue to everyone's satisfaction (except the Apple III, it will have to wait).

So on the February 22, 1982, the big event — Negus arrived home! Negus (so named by my wife after a television personality who is also handsome and intelligent) is an Atari 400.

For $975, Computerland supplied the Atari 400, expansion to 32K, Atari cassette recorder, two joy-sticks, and ten cassette programs, mostly games

For an extra $600 or so, we bought some more software: mailing list (1 cassette), chess (cartridge), touch typing (two cassettes), Star Raiders (cartridge), Asteroids (cartridge), Spanish (five cassettes, to be delivered), and Graph It (two cassettes).

The Atari 400

I have studied the microcomputer market for nearly six years. I followed developments in hardware and software with great interest. I edit a microcomputer journal. Yet the Atari astonished me with its comprehensive design philosophy, its well finished equipment, and the quality of its documentation.

Hardware expansion is straight-forward via an expansion interface, and there is a disk drive and printer available. I bought the Atari thinking that it would be an interim device until the Apple III came within range of my budget. I was wrong!

Negus feels like a toy, looks like a toy — but it is powerful and its usefulness is entirely satisfactory for home use. Negus is a work horse, giving far more value for money than I had expected.

Early Impressions

Plastic keyboards have an unhappy reputation, not for performance, but for tactile response.

The Atari 400 has indented keys which require considerable (a relative) pressureto be activated. Indeed, our cats have walked over the keyboard without registering a key strike. I am happy with the keyboard. It is not suitable for say, a professional typist — but for hack-work it is fine.

The screen is 40 characters wide (0-39 characters). The de-facto standard in microcomputers for line width, particularly for business applications, is 80 characters. Atari's 40 characters is fine for home use — the line wraps around for 116 characters.

After all that study of the field, I discovered a minimum of 16K is the equivalent of computing on one leg — 32K should be considered almost essential (it's necessary for best results with the disk drive). I will expand Negus to 48K when it is available.

The Atari cassette, at $120, is not cheap; but consider a special feature — it can record and play two tracks, one for digital and one for audio.

We expect the Spanish package to exploit this feature by playing digital commands to Negus and Spanish to the listener! This system has great potential — unfortunately, the present cassette machine does not have an input for that audio track. Hopefully this circumstance might change.

On cassettes — the common advice is to keep as many program copies on cassette as possible. This is due to the failure rate of cassettes. Rather than be overrun

with cassettes, I copy my software onto the best cassettes I can afford — either the Ampex Grand Master II, or the TDK SA-X.

These cost about $4.50 each for 60 minutes, but the sound of their transport system is reassuringly quiet after the racket of the cheaper, shorter cassettes. Perhaps we can persuade Ampex and TDK to package 10-minute cassettes onto their high quality transport drives.

On cassette times — it takes about four minutes to load a 24K program. This is a long time but it is no real handicap yet.

Remember that a computer must fit into the household routine — four minutes is long enough to let the cats out, or organise a cup of coffee, go to the toilet or iron a shirt. The most valuable use of the cassette loading time is to take another quick look at the manual for the system being loaded.

The Atari had a very pleasant surprise in store for me. Remember I was looking for high resolution graphics? High resolution is the Apple standard — 280 by 192. According to *Atari Basic*, by Bob Albrecht, LeRoy Finkel and Gerald Brown, the Atari has eight colour modes with a maximum resolution of 158 by 80.

However, the Atari Basic Manual fully describes *nine* graphics modes — the maximum resolution being 320 by 160.

Another nice surprise was that the operating system switches all the colours on the screen if a key has not been pressed for about eight minutes. The colours keep changing until any key is pressed.

This reduces the chances of Negus burning out the phosphor coating inside his video tube. It is an example of the careful design that has gone into the Atari system. Clearly, Negus has fine parents.

What We Learned

My wife has had only a cursory look at programming — learning how to operate the various systems is more rewarding and useful at the moment, and BASIC won't go away.

BASIC has been bad-mouthed, but I have found Atari's BASIC okay (wait till the disk drive arrives, I hear you say). Screen editing could be easier, but it is an adequate trade-off for cost/performance/memory.

The graphics and sound controls appear complicated but that is only because Atari offers a complex mixture of both. This area is one of Atari's great strengths — there is no chance of being bored when developing or using these features.

I discovered that high resolution graphics is nice to have — but fine lines are hard to see. Thankfully, Atari offers nine levels of graphics controls.

Star Raiders is a superb presentation on Atari; yet, I don't have much time for games. Running a suburban household, along with family commitments and a microcomputer group, limit the amount of time available for computing.

This has transformed Negus from a fun machine to a tool for achieving specified purposes (lists, graph presentations).

I'm glad I bought an extra copy of Atari BASIC by Albrecht. The second copy is in the car — when I have a few spare minutes waiting in the car for my wife, I read more of the manual.

The Apple set a high standard for the quality of its documentation — Atari has spent a good deal of time and money on matching that standard. My wife and I appreciate the thoughtfulness behind this policy.

Next on the budget is a disk drive, then a printer and expansion interface. Visicalc, and two word processing packages, are available. So is the facility for telecommunications.

Next year, I will investigate the feasibility of buying Negus's big brother, the Atari 800, which has a connection for a video monitor. A second computer will reduce competition between myself and my wife for Negus.

Other Atari users should feel free to exchange information with me. Intending buyers will receive simple advice — buy an Atari today! □

Chris McEwan, of Canberra, is convenor of the Microprocessor Special Interest Group (MICSIG) of the Canberra branch of the Australian Computer Society.

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How To Justify Computing...

By Garnett Znidaric

THE SUN was still high in the sky when my microcomputer arrived; unknown adventure lay before me...

But, before the adventure could begin I would have to answer a few questions — the same questions I still ask myself whenever I consider expansion.

The problem at the time was that it was my mother asking the questions as I unwrapped the device, and she expected answers.

"What is it? What use will it be to the business? Who can use it? As far as I can see, it's a waste of money!" she demanded.

Now, some twelve months later, after writing and running all my own software I can say that a computer is a 'fun' thing which can be very useful to a business, large or small. Already my computer has paid for itself and is currently paying off a disk system.

Computer Magazines

One of the functions of computer magazines such as *Your Computer* is to help introduce the uninitiated to the world of computers. It also provides several biased and un biased points of view on various machines as opposed to one-eyed, biased salesmen.

Our children as well as ourselves are finding every day that more and more of the articles that we use are microprocessor controlled. Car ignitions, clocks, pacemakers, satellites and even the good ol' electric iron that mum uses.

Our own Telecom predicts that computer terminals will replace telephone directories by the end of the decade. The French authorities forecast there will be a phone directory terminal in each Parisian home around the mid eighties.

Most school children these days are receiving some education in computers. Although at the moment a lot of this is confined to just playing games on the school machines, the level of computer education is increasing with the increase of the number of machines available to the students.

Get my drift dad? The best way for a child to learn, or anyone for that matter, is to spend as much time as is practical and possible on the computer. The children of today will survive with computer literacy. Without, they will only exist.

In America, for example, a special programming language has been written for small children which utilises shapes instead of numbers for teaching programming as well as arithmetic and writing.

The system is disliked by some teachers for the main reason that the children like it. The machine is dumb and the children have to teach the 'dumb' machine. The machine doesn't scream if a mistake is made.

The children even seem to learn more efficiently in a shorter period of time as the computer isn't boring. In short, the teachers are afraid their jobs will be in jeopardy.

Some even say that computers are anti-social, but the childrens' peaceful friendliness towards each other disproves this contention.

What's In It For Us?

I suppose you can balance cheque books and do all sorts of fiscal statistics in the home like Dick Smith and Tandy say, but I don't.

On the other hand you could use it for working out proportions for cooking, using recipes for a set number of people and modifying it to suit the expected crowd.

On this point, I was talking to a panel beater who has a $13,000 problem each year with wasted paint. The concept of using a computer to mix the correct quantities could possibly save quite a bit of money.

The problem is that a door requires, say, 100ml of paint and the smallest quantity that can be made according to the colour's recipe is 250ml. In short, a lot of paint is wasted. The food program, rehashed, could be a good money saver to this panel beater.

In many ways a computer can replace the family calculator. Actually this is where my home-grown software really comes in handy. I buy a lot of timber and hardware from a place which has several discount rates, many of which may appear on the same docket. The result is that on the computer I can check these dockets quickly and accurately with ease.

Calculators can do the same job, but the operation is complex, time consuming and can be expensive if interrupted. Not to mention the errors that can creep in.

Actually this is where the computer has paid for itself — it manages to find mistakes worth real dollars all the time. Mistakes that have to cost somebody, somewhere. I just make sure they don't cost me...

All this is possible due to computer magic. Consider the statement A=A+B where A

0. Mathematically it is impossible, but if you imagine the computer going in a loop, doing a fresh calculation each time, and using this statement each time it returns to the start of the loop, then its potential value as a running total, score-keeper and the like can easily been seen.

Another region where the computer makes a large step forward is in the field of word processing. Although it doesn't improve one's hand writing (mine would horrify you), it does allow you to compose, edit, correct, insert and generally create 'perfect' text. Provided, that is, you know how to spell — although, for a little more money, this problem can even be corrected.

Hopefully by now I have almost sold you a computer, but before you rush out to buy, read on.

Let The Buyer Beware

As with most things, the last person you should listen to when you want to buy something is the salesman.

Salesmen seem to be a strange breed of person who are either chasing commission or promotion. Either way, they want your dollar first and you to get value for money second or third.

So who do you see? Easy, people who own and use them. People who program them and the people who work on them.

I bought my machine through a software consultant, and I am more than pleased with my choice as far as value for dollar is concerned.

In essence, the most important thing to do is listen, and keep your hands in your pocket, unless they are prepared to give you some hands-on time. Read as much as you can. Magazines such as this one review different machines and explain problems usually much better than salesmen.

And when the decision has almost been made, why not visit a computer club or two as this will give you the chance to meet and talk with people who, like yourself, want to learn about the realm of computing.

Which Computer Is Best

Not all people would be suited by the same car. The same definitely applies to computers.

I have no use for a system larger than I have, yet a large business would laugh at my machine. I dabble in engineering problems and this often involves trigonometry, and yet many machines don't offer trig functions. I bought a cheap machine that did.

Some machines expand easily and cheaply. Some are expensive to expand, and some won't (without major rebuilding).

Therefore all I can say is as part of your questioning, you must carefully ask yourself what it is you want from a computer and then shop around for something that will do what you ask.

Do It — You'll Enjoy It

If you haven't got one yet, get one. You will enjoy the experience, although some frustration may appear from time to time.

If you don't like what it is saying, just switch it off and back on and you are on speaking terms again. It's a pity that the rest of the world wasn't like that. Maybe we would run out of the need for wars.

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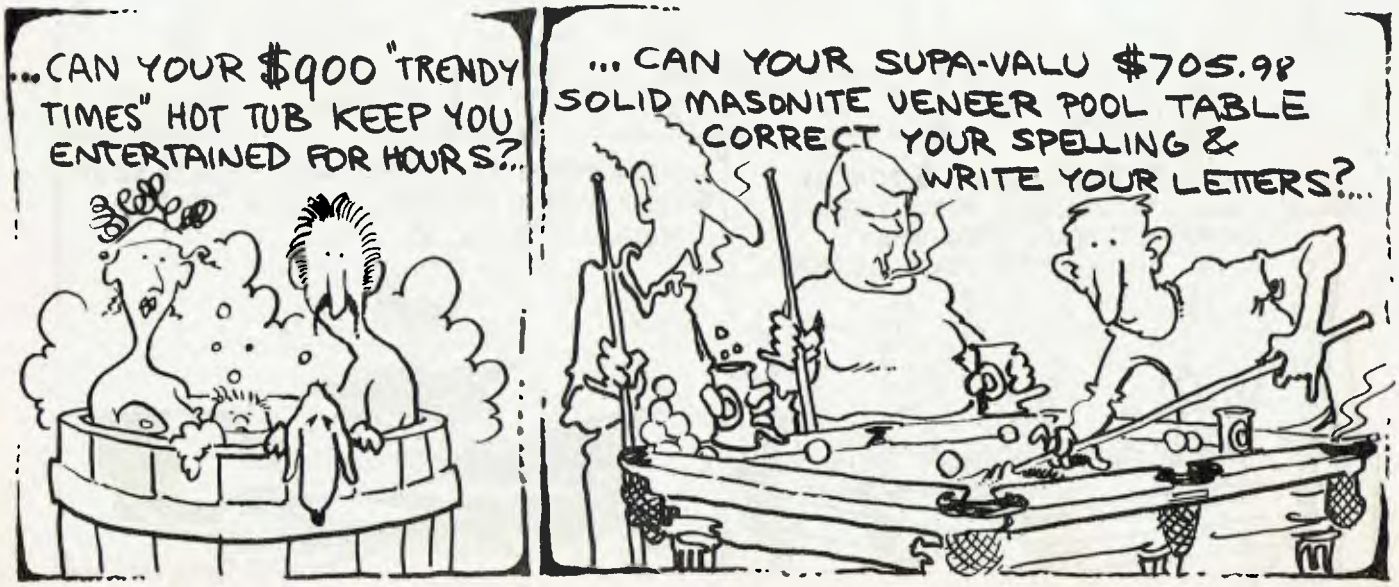

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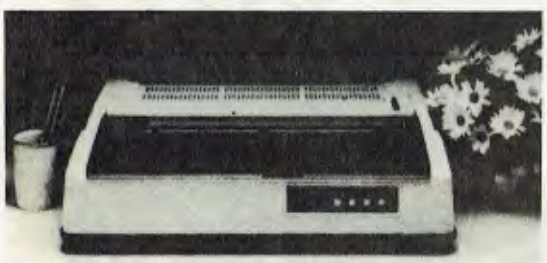

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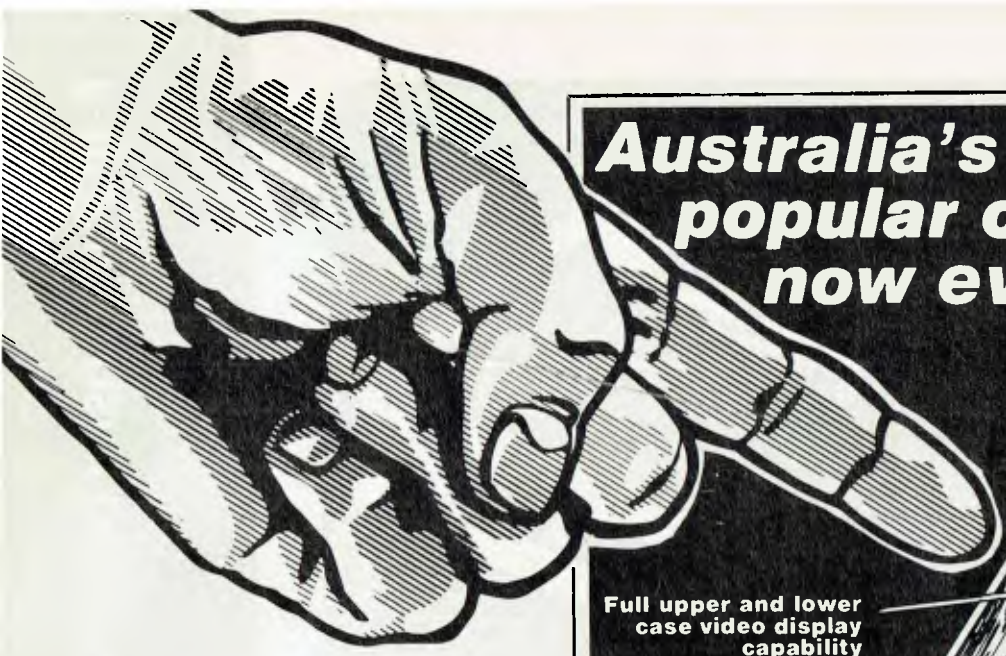

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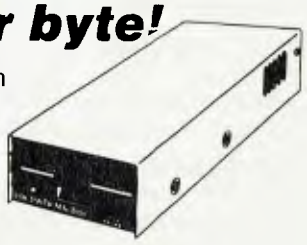

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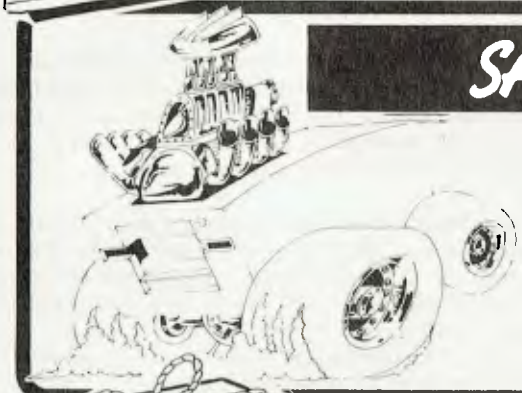

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Basic for Birdwatchers
Part IX

This month LES BELL develops the searching theme with some speedier and more useful routines — binary searches.

WE'VE SEEN how hashing can be used to speed up searches — now it's time to look for some other techniques to speed them up and make them more useful.

Prime among the possibilities is a technique known as binary searching. It's easiest to approach this type of search from an intuitive basis, so we'll go right back to the everyday concepts of searching.

The easiest form of search is the sequential search. To illustrate this, imagine you have a pile of magazines, in no particular order, and you are searching for the November 1981 issue of *Your Computer*.

Start At The Top

The easiest way to do this is to start at the top of the pile and work your way down, checking to see if each magazine is the one you want.

That is the simplest form of sequential search, and as far as that particular problem is concerned, it's about the only one.

Now, imagine that instead of a pile of magazines you have a binder containing the magazines in sequence. Your approach to the problem will be different. You will open the binder somewhere in the middle, and check to see if the issue you are looking at is later or earlier than the one you want.

If it is later, you'll move towards the front of the binder. If it's too early, you'll move towards the back. Then you repeat the process. This is, believe it or not, a rough form of binary search.

Opening your November 1981 copy of *Your Computer* to page 28 will involve you in another form of binary search: open to the centre, that's page 50, no, too high, flick back a bit, 24, that's too low, forward a bit — got it!

We can take this analogy one step further: on the lower right of page 28 is a program which invites the player to guess a number between 1 and 100 inclusive. Try it now and see if you can come up with a strategy to minimise the number of turns you need to get the 'hidden number'.

Solid Thinking...

By now, you should have quite a good intuitive 'feel' for what a binary search is, so it's time to make our thinking a bit more concrete.

To do this, we'll write out an algorithm for binary search, and then write a program to perform it. Here's the algorithm:

1. Set our upper limit, **u**, to 100, and the lower limit, **l**, to 1.

2. Check for inconsistency: if l is greater than u, something's wrong, and we're not able to find the number. Otherwise, our best guess for the number, **g**, is g = INT(l + u)/2.

3. Now compare (the computer does this for us in the game). If the computer's number, **i**, is less than our guess (i is less than g) then adjust upper limit: u = g-1, and go to step 2. If i is greater than g, then adjust lower limit: l = i + 1, and go to step 2. If i = g then the algorithm has found us the right answer.

The whole procedure is quite simple and easy to follow (if a computer can do it...). The test for inconsistency in step 2 really indicates that one of the clues your opponent has given you is wrong, since otherwise, for this simple case, the algorithm is *guaranteed* to give you the right answer eventually.

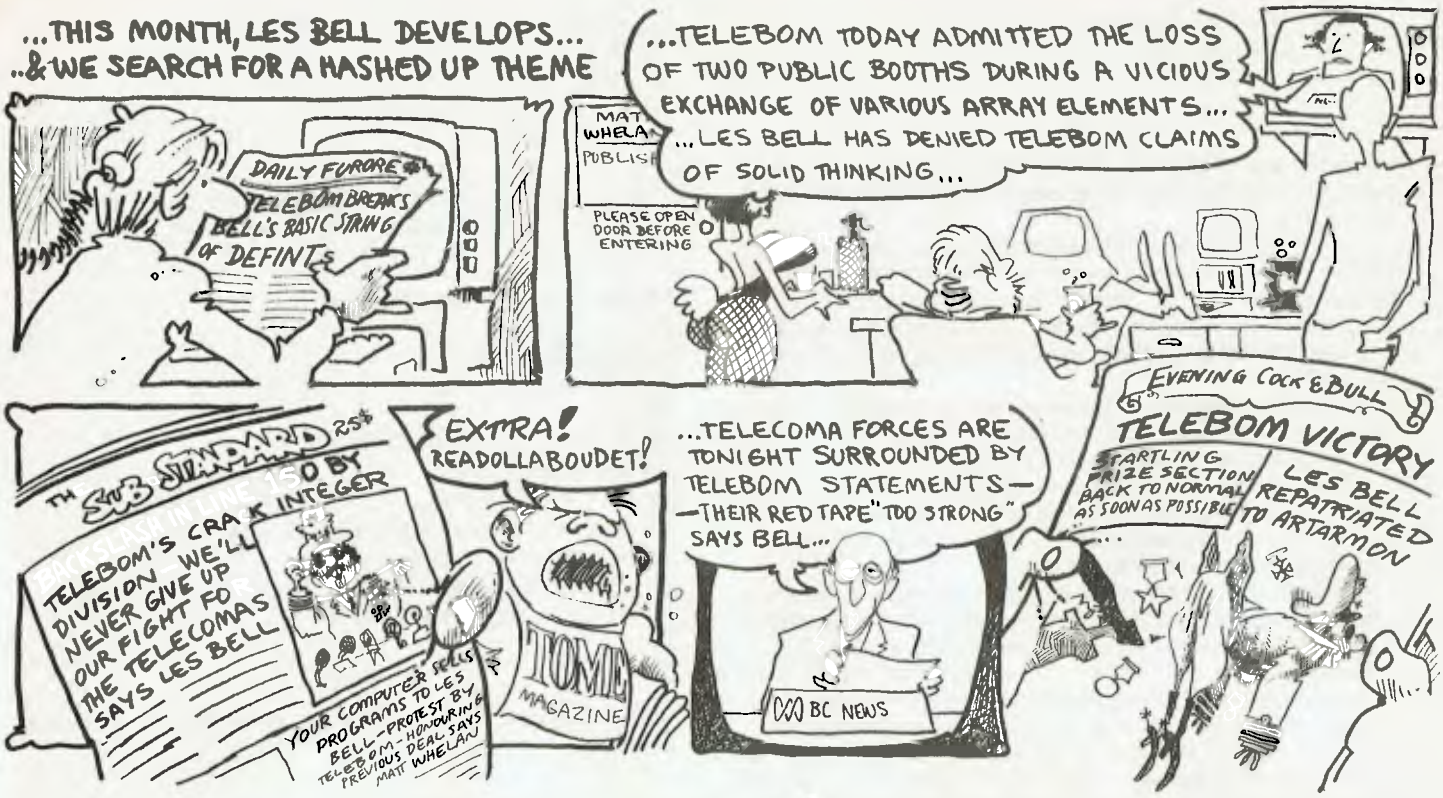
If we were searching through a table of names, on the other hand, if the lower limit is greater than the upper limit, it indicates that the name we are looking for is not in the table.

I said above that this algorithm is *guaranteed* to give the right answer eventually, but how eventual is eventually?

In playing around with the game above, you should have been able to get your average down to under 7 moves. The log to the base 2 of 100 is 6.64 — the algorithm will *always* get the answer in seven moves or less (if you don't cheat on it!).

Here's the algorithm coded up in BASIC:

```
100 REM     ### PROGRAM TO GUESS A NUMBER ###
110 REM     ### WRITTEN IN MBASIC V 5.2   ###
120 :
130 L = 1: U = 100: C = 0
140 IF U < L THEN PRINT "I give up. You've confused me!": END
150 G = (L + U) \ 2
160 PRINT "My guess is";G
170 C = C + 1
180 INPUT "Am I too high (H) or low (L) or right (R)";A$
190 IF A$ = "H" OR A$ = "h" THEN U = G - 1: GOTO 140
200 IF A$ = "L" OR A$ = "l" THEN L = G + 1: GOTO 140
```


...THIS MONTH, LES BELL DEVELOPS...
..& WE SEARCH FOR A HASHED UP THEME
DAILY FURORE
TELEBOM BREAKS BELL'S BASIC STRING OF DEFINTS
...TELEBOM TODAY ADMITTED THE LOSS OF TWO PUBLIC BOOTHS DURING A VICIOUS EXCHANGE OF VARIOUS ARRAY ELEMENTS...
...LES BELL HAS DENIED TELEBOM CLAIMS OF SOLID THINKING...
PLEASE OPEN DOOR BEFORE ENTERING
EVENING COCK & BULL
TELEBOM VICTORY
STARTLING PRIZE SECTION BACK TO NORMAL AS SOON AS POSSIBLE
LES BELL REPATRIATED TO ARTARMON
EXTRA! READOLLABOUDET!
TELEBOM'S CRACK INTEGER DIVISION WE'LL NEVER GIVE UP OUR FIGHT FO THE TELECOMAS SAYS LES BELL
YOUR COMPUTER SELLS PROGRAMS TO LES TELEBOM-PROTEST BY PREVIOUS DEAL SAYS MATT WHELAN
TOMC MAGAZINE
...TELECOMA FORCES ARE TONIGHT SURROUNDED BY TELEBOM STATEMENTS—
—THEIR RED TAPE "TOO STRONG" SAYS BELL...
BC NEWS

...AND SO, BACK AT SUNNY BELL ESTATE...
HERE'S YOUR CHANCE TO TAKE OVER
"...& BELL SAID, "THEY WON'T TELL ON ME, IF I DON'T TELL ON THEM"..."
TRAITOR
THE DIRTY DOUBLE CROSSER
THE DOG!
NOON BELL GONE

...AN' I NEVER GOT TO HAVE MY GO ON THE SWITCHES WHERE THEY CUT PEOPLE OFF AN' SUCH...
..YEH?—I WAS PROMISED A RIDE ON A CO-AXIAL CABLE...
THERE HE IS!
...THIS METHOD OF STORAGE ALLOCATION ISN'T PARTICULARLY EFFICIENT...SO I'LL SEE YOU NEXT MONTH... OK?
LET'S STRING HIM UP FROM THE NEAREST BINARY TREE!
©BJ.AKHURST. 82.

```
210 PRINT "I got it in";C;"goes!"
220 INPUT "Try again";A$
230 IF A$ <> "Y" AND A$ <> "y" THEN END
240 GOTO 130
```

L is the lower limit, U is the upper, C counts the number of turns and G is the computer's guess. Hmm. What's that backslash in line 150?

BASIC usually works with real numbers, complete with fractional parts. In this case, we want the average of the two limits to be a whole number, an integer. The backslash will perform an integer division, so that 101 divided by 2 using it would equal 50, or more confusingly, 1 divided by 2 would equal 0 (think, what's INT(½)?).

The advantages of the backslash division are that it's more convenient when you know you want an integer result, and it's also faster when working only with integers.

As we've seen earlier, we can tell BASIC our variables are integers by sticking a % sign onto them, so that I is real, while I% is an integer. Conveniently, BASIC will treat these two as separate variables and not confuse them.

A simpler way to make whole groups of variables integers is to use Microsoft BASIC's DEFINT statement. With this statement at the top of a program, there's no need for lots of messy %'s.

The statement 'DEFINT I — N' means that any variable names beginning with those letters should be taken as integers, unless overridden with other specific type declaration characters ($, ! and #). This is particularly useful for us old FORTRAN programmers, since in FORTRAN all variable names starting in I — N are automatically taken as integers (which is, incidentally, the reason why I, J and N are so often used for loop counters).

A similar statement, DEFDBL, will declare groups of variables to be double precision, while the statement 'DEFSTR A,L,Q' declares variables with those initials to be strings. There is also a DEFSNG statement, but it's not often seen.

Indexing For Speed

In our earlier attempts at a mailing list program, we sorted the entire file in memory, and found that we were rapidly running out of space. We can use the concept of indexing, introduced earlier, to get out of that bind, and provide much greater speed at the same time.

In the previous example of indexing, rather than exchange all the various array elements which made up a record, we simply exchanged an index variable which pointed to them. We can use the same technique to save us having to read in every element of a file to be sorted. We'll simply set up two parallel arrays, one containing the surnames (the keys to sort on), and the other the position of the record in the file.

The array of keys and indexes can be stored as a separate sequential file, to be read in at the beginning of a session.

Using this technique, here's a much improved telephone directory program:

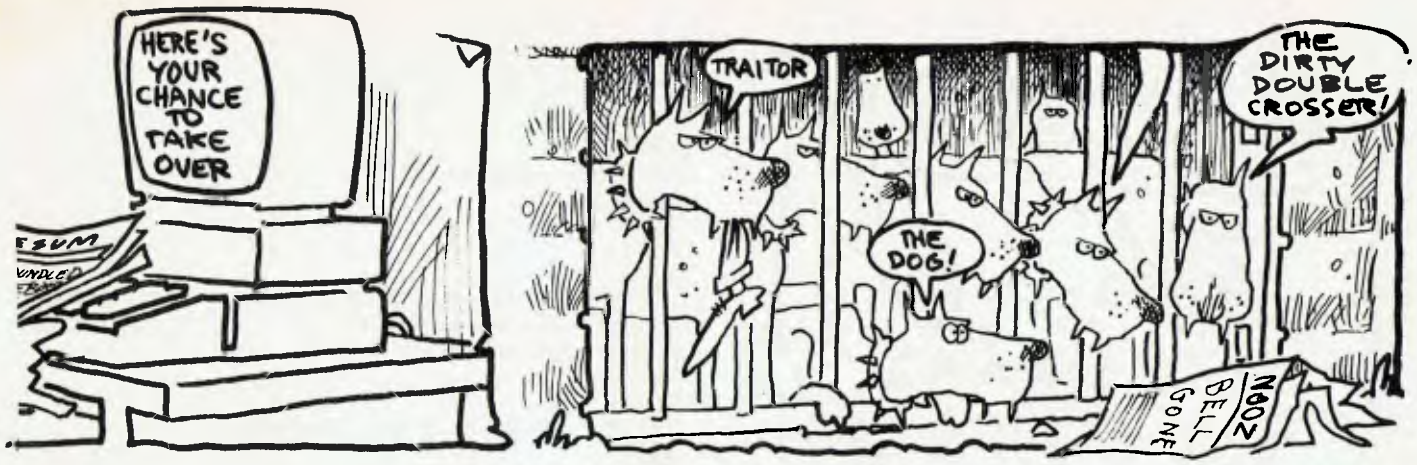
```
100 REM     ### INDEXED TELEPHONE FILE ###
110 REM     ### WRITTEN IN MBASIC 5.2 ###
120 REM     ### BY LES BELL, 6/15/82 ###
130 :
140 REM    INITIALIZATION SECTION
150 :
160 DEFINT I - N
170 DEF FNGXY$(X,Y)=CHR$(27)+"="+CHR$(Y+31)+CHR$(X+31)
180 DEF FNHT$(A$)=CHR$(27)+")"+A$+CHR$(27)+"("
190 DEF FNLN$(L)=STRING$(L,95)
200 HOME$=CHR$(30)
210 CLS$=CHR$(27)+CHR$(26)
220 DIM N$(256), K(256)
230 TL%=100:                    ' TIME DELAY
240 PRINT CLS$
250 INPUT "Telephone directory file";F$
260 IF F$="" THEN F$="INTELE"
270 :
```

After initialising the various functions, we can go ahead and read in the sequential file containing the indexes:

```
280 REM    ### READ INDEX FILE ###
290 :
300 ON ERROR GOTO 570
310 OPEN "I",#1,F$+".IND"
320 N=1
330 IF EOF(1) THEN CLOSE 1: GOTO 360
340 INPUT#1,N$(N),K(N)
350 N = N + 1: GOTO 330
360 PRINT: PRINT: PRINT N-1;"Records in file"
370 OPEN "R",#2,F$+".TDR"
380 FIELD #2,20 AS FM$,20 AS FC$,30 AS FA1$,20 AS FA2$,4 AS
    FPC$,15 AS FTEL$,19 AS FCT$
390 :
```

The menu section is virtually the same as in the preceding chapter:

```
400 REM     ### DISPLAY MENU ###
410 :
420 PRINT CLS$
430 PRINT "1 - Add name"
440 PRINT "2 - Delete name"
450 PRINT "3 - Find name"
460 PRINT "4 - Find comment"
470 PRINT "5 - List file to CON:"
480 PRINT "6 - Pack and Sort index"
490 PRINT "7 - Quit and return to CP/M"
500 PRINT: PRINT "Enter choice:";
510 A$ = INKEY$
520 WHILE A$<"1" OR A$ > "7"
530   A$ = INKEY$
540 WEND
550 ON ASC(A$)-48 GOTO 720,1810,1310,2350,1110,1640,630
560 :
570 IF ERR=53 THEN CLOSE: PRINT "File does not exist - creating
    one.": N=1: RESUME 370
580 PRINT "Error";ERR;"in line";ERL: STOP
590 :
```



Before exiting, the updated and sorted index file should be written out to file. The subroutine at 1660 sorts the index array into ASCII order, while the subroutine at 2150 compresses the data file to save space.

```
600 REM     ### EXIT MBASIC ###
610 :
620 REM WRITE INDEX FILE
630 GOSUB 1660: GOSUB 2150: REM SORT INDICES AND PACK FILE
640 OPEN "O",#1,F$+".IND"
650 FOR I=1 TO N-1: IF K(I) = 0 THEN 670
660 WRITE#1,N$(I),K(I)
670 NEXT I
680 PRINT CLS$: CLOSE: END
690 :
```

If a name has been deleted, then the file should be packed before any more are added. If DELFLG is set, a name has been deleted, and the file is automatically sorted and packed.

```
700 REM     ### ROUTINE TO ADD A NAME TO FILE ###
710 :
720 IF DELFLG = 1 THEN GOSUB 1660: GOSUB 2150
730 PRINT CLS$;"Add name to file ":FOR I=1 TO TL%: NEXT I
740 PRINT CLS$
750 PRINT FN6XY$(1,3);FNHT$("Surname     : ");FNLN$(20)
760 PRINT FNHT$("First Name  : ");FNLN$(20)
770 PRINT FNHT$("Street      : ");FNLN$(30)
780 PRINT FNHT$("Town/City   : ");FNLN$(20)
790 PRINT FNHT$("Postcode    : ");FNLN$(4)
800 PRINT FNHT$("Telephone   : ");FNLN$(15)
810 PRINT FNHT$("Comment     : ");FNLN$(19)
820 PRINT FN6XY$(13,3);:INPUT N$
830 IF N$ = "" THEN 420
840 PRINT FN6XY$(13,3);": ";N$;SPACE$(20-LEN(N$))
850 PRINT FN6XY$(13,4);:INPUT C$
860 PRINT FN6XY$(13,4);": ";C$;SPACE$(20-LEN(C$))
870 PRINT FN6XY$(13,5);:INPUT A1$
880 PRINT FN6XY$(13,5);": ";A1$;SPACE$(30-LEN(A1$))
890 PRINT FN6XY$(13,6);:INPUT A2$
900 PRINT FN6XY$(13,6);": ";A2$;SPACE$(20-LEN(A2$))
910 PRINT FN6XY$(13,7);:INPUT PC$
920 PRINT FN6XY$(13,7);": ";PC$;SPACE$(16)
930 PRINT FN6XY$(13,8);:INPUT TEL$
940 PRINT FN6XY$(13,8);": ";TEL$;SPACE$(15-LEN(TEL$))
950 PRINT FN6XY$(13,9);:INPUT CT$
960 PRINT FN6XY$(13,9);": ";CT$;SPACE$(19-LEN(CT$))
970 REM    ### WRITE RECORD TO DISK ###
980 LSET FM$ = N$
990 LSET FC$ = C$
1000 LSET FA1$ = A1$
1010 LSET FA2$ = A2$
1020 LSET FPC$ = PC$
1030 LSET FTEL$ = TEL$
1040 LSET FCT$ = CT$
1050 PUT #2,N
1060 N$(N) = N$: K(N) = N
1070 N = N + 1
1080 GOTO 720
1090 :
```

In the 'list file' routine, records are retrieved in key sequence. The pause routine works in exactly the same way as the one in the 'hashing' example.

```
1100 REM     ### LIST FILE TO CON: ###
1110 FOR I = 1 TO N-1
1120 IF K(I) = 0 THEN 1280
1130 GET #2,K(I)
1140 PRINT CLS$;I
1150 PRINT FN6XY$(1,3);FNHT$("Surname     : ");FM$
1160 PRINT FNHT$("First Name  : ");FC$
1170 PRINT FNHT$("Street      : ");FA1$
1180 PRINT FNHT$("Town/City   : ");FA2$
1190 PRINT FNHT$("Postcode    : ");FPC$
1200 PRINT FNHT$("Telephone   : ");FTEL$
1210 PRINT FNHT$("Comment     : ");FCT$
1220 PRINT FN6XY$(40,24);: PRINT "Hit space bar to hold, ESC to
     quit";
1230 FOR J=1 TO TL%
1240 A$=INKEY$: IF LEN(A$) = 0 THEN 1270
1250 IF A$ = " " THEN J = 1
1260 IF A$ = CHR$(27) THEN 420
1270 NEXT J
1280 NEXT I
1290 GOTO 420
1300 :
```

This section is the actual binary search, followed by a section to read in the record from the data file and display it.

```
1310 REM    ### ROUTINE TO FIND NAME ###
1320 :
1330 PRINT CLS$;"Search file for name"
1340 PRINT FN6XY$(1,5);:INPUT "Name to find";N$
1350 REM    ### BINARY SEARCH ON N$(N) ###
1360 L = 1: U = N - 1: 'SET UPPER AND LOWER BOUNDARIES
1370 IF U < L THEN 1570
```

```
1380 I = (U + L) \ 2
1390 IF N$ < N$(I) THEN U = I - 1: GOTO 1370
1400 IF N$ > N$(I) THEN L = I + 1: GOTO 1370
1410 GET #2,K(I)
1420 PRINT FNGXY$(1,3);FNHT$("Surname     : ");FM$
1430 PRINT FNHT$("First Name  : ");FC$
1440 PRINT FNHT$("Street      : ");FA1$
1450 PRINT FNHT$("Town/City   : ");FA2$
1460 PRINT FNHT$("Postcode    : ");FPC$
1470 PRINT FNHT$("Telephone   : ");FTEL$
1480 PRINT FNHT$("Comment     : ");FCT$
1490 PRINT FNGXY$(40,24);"Hit space to continue, ESC to quit";
1500 A$ = INKEY$
1510 WHILE A$ <> " " AND A$ <> CHR$(27)
1520   A$ = INKEY$
1530 WEND
1540 IF A$ = " " THEN I = I + 1:IF I < N THEN 1410
1550 GOTO 420
1560 :
1570 REM     ### UNSUCCESSFUL ###
1580 :
1590 PRINT CLS$;"Not found";
1600 FOR I = 1 TO TL%:NEXT I
1610 GOTO 420
```

This is a standard Shellsort on the name field. In line 1710, the SWAP statements can be replaced by appropriate GOSUBs. The sort does not use indexing itself; there is actually not much point, since BASIC uses indexes internally to allocate string storage.

```
1620 REM     ### SORT INDEX ARRAY ###
1630 :
1640 GOSUB 1660: GOSUB 2150: GOTO 420
1650 REM     ### SORT SUBROUTINE ###
1660 PRINT CLS$;"Sorting index. Please wait"
1670 M = (N-1)/2
1680 L = N - M - 1
1690 FOR J = 1 TO L
1700  FOR I = J TO 1 STEP -M
1710    IF N$(I) > N$(I+1) THEN SWAP N$(I), N$(I+1): SWAP K(I), K(I+1)
1720     PRINT ".";
1730  NEXT I
1740 NEXT J
1750 M = M \ 2
1760 IF M <> 0 THEN 1680
1770 RETURN
1780 :
```

Deletion is achieved by doing a binary search on a name to locate it, then simply setting the index of a name to zero; there can't be a zeroth record in a file.

```
1790 REM    ### ROUTINE TO DELETE NAME FROM FILE ###
1800 :
1810 PRINT CLS$;"Delete name from file"
1820 PRINT FNGXY$(1,5);:INPUT "Name to delete";N$
1830 REM    ### BINARY SEARCH ON N$(N) ###
1840 L = 1: U = N - 1: 'SET UPPER AND LOWER BOUNDARIES
1850 IF U < L THEN 1570
1860 I = (U + L) \ 2
1870 IF N$ < N$(I) THEN U = I - 1: GOTO 1850
1880 IF N$ > N$(I) THEN L = I + 1: GOTO 1850
1890 GET #2,K(I)
1900 IF LEFT$(FM$,1) = ";" THEN K=K+1:GOTO 1320
1910 IF LEFT$(FM$,1)=" " THEN PRINT CLS$;"Not found":FOR J = 1 TO
     TL%:NEXT J:GOTO 420
1920 PRINT CLS$
1930 PRINT FNGXY$(1,3);FNHT$("Surname     : ");FM$
1940 PRINT FNHT$("First Name  : ");FC$
1950 PRINT FNHT$("Street      : ");FA1$
1960 PRINT FNHT$("Town/City   : ");FA2$
1970 PRINT FNHT$("Postcode    : ");FPC$
1980 PRINT FNHT$("Telephone   : ");FTEL$
1990 PRINT FNHT$("Comment     : ");FCT$
2000 PRINT FNGXY$(40,24);"Delete (Y/N)";
2010 GOSUB 2070
2020 IF A$ <> "Y" AND A$ <> "y" THEN I = I + 1:GOTO 1890
2030 K(I) = 0: DELFLG = 1
2040 GOTO 420
2050 :
2060 REM     ### SUBROUTINE TO RETURN Y/N RESPONSE IN A$ ###
2070 A$ = INKEY$
2080 WHILE A$ <> "Y" AND A$ <> "y" AND A$ <> "N" AND A$ <> "n"
2090   A$ = INKEY$
2100 WEND
2110 RETURN
2120 :
```

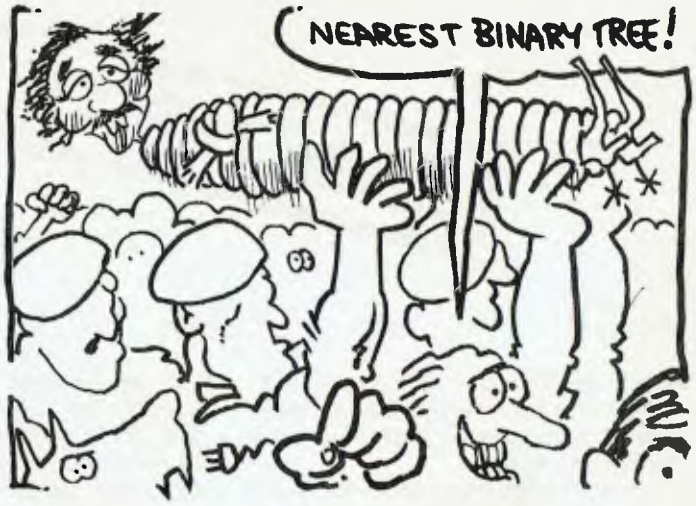
The pack routine simply checks to see if a record has a corresponding index, and if it has, writes it back out. Because deleted records are not re-written, the file is gradually compacted.

```
2130 REM     ### PACK RANDOM FILE ###
2140 :
2150 PRINT CLS$;"Packing data file.";
2160 D = 0
2170 FOR S = 1 TO LOF(2)
2180 T$=SPACE$(20)
2190 GET#2,S
2200 N$ = FM$
2210 L=1: U=N-1
2220 IF U<L THEN 2300
```

```
2230 I = (U + L) \ 2
2240 LSET T$ = N$(I)
2250 IF N$ < T$ THEN U = I - 1: GOTO 2220
2260 IF N$ > T$ THEN L = I + 1: GOTO 2220
2270 IF K(I) = 0 THEN 2300
2280 D = D + 1
2290 PUT#2,D:K(I) = D:PRINT ".";
2300 NEXT S
2310 DELFLG = 0
2320 RETURN
```

The 'find comment' routine is a straightforward sequential search.

```
2330 REM     ### FIND COMMENT ###
2340 :
2350 PRINT CLS$; "Find comment"
2360 PRINT FNGXY$(1,5);:INPUT "Comment to search for";CT$
2370 FOR I=1 TO LOF(2)
2380 IF K(I) = 0 THEN 2550
2390 GET #2,K(I)
2400 IF LEFT$(FCT$,LEN(CT$)) <> CT$ THEN 2550
2410 PRINT CLS$;
2420 PRINT FNGXY$(1,3);FNHT$("Surname     : ");FM$
2430 PRINT FNHT$("First Name  : ");FC$
2440 PRINT FNHT$("Street      : ");FA1$
2450 PRINT FNHT$("Town/City   : ");FA2$
2460 PRINT FNHT$("Postcode    : ");FPC$
2470 PRINT FNHT$("Telephone   : ");FTEL$
2480 PRINT FNHT$("Comment     : ");FCT$
```




```
2490 PRINT FNGXY$(40,24);: PRINT "Hit space bar to hold, ESC to quit";
2500 FOR J=1 TO TL%
2510 A$=INKEY$: IF LEN(A$) = 0 THEN 2540
2520 IF A$ = " " THEN J = 1
2530 IF A$ = CHR$(27) THEN 420
2540 NEXT J
2550 NEXT I
2560 GOTO 420
```

This method of storage allocation is still not particularly efficient, particularly in its reclamation of space occupied by deleted records. Next month, we shall go on to look at linked lists and binary trees.

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CASE HISTORY

By Michael Marshall

WHEN an "old man" of 55 decides to enter a new field of endeavour, he must have a great deal of enthusiasm, or confidence, or both.

Steve Colman, who spent some 20 years managing major manufacturing and trading organisations, has that enthusiasm and confidence even though it has taken him a long time to realise it.

He first saw a computer in 1965 when his boss, the later Sir Raymond Purves, told him that he picked one up for some 150,000 pounds (around a cool $1.5 million in today's terms.)

It must have been quite a computer; it was run by a staff of 12, had a special air-conditioned set of rooms with airlocks for cleanliness, and broke down if too many people breathed on it as it had an aversion to high humidity. It was also less powerful and slower than today's desktop computers.

When, years later, he saw his first microcomputer, Colman came to the conclusion that these things may become popular with kids, who do not know what to do with their time and money. His opinion changed somewhat when he played chess with one of these things and found that he had no chance to beat it, even though the computer was playing at its lowest possible level of knowledge. He was quite impressed, but it was still a toy — albeit a good one.

It was in 1979 that he was next exposed to a microcomputer. It shall be nameless, but let's agree that its name starts with T. T's instruction book was difficult to understand, talking about all sorts of basic things which were not really basic, but BASIC.

Not having patience, nor any programs, nor a tape, Colman decided to play around and after two or three hours of concentrated thought, trials and error came up with a complicated program: which went something like this

```
10 INPUT "HOW OLD ARE YOU? ";A
20 B=1979-A
30 ?"YOU WERE BORN IN ";B
40 GOTO 10
```

The amazing thing was that it worked; it was marvellous. Steve was a programmer. Steve tamed the computer age.

Spurred on by his success he decided to become a real expert. He borrowed a book and noticed that a man named John Kemeny with a Mr Kurtz had written a book about the BASIC language which, as we all know, is the basic language of microcomputerdom and without which micros would still be the highly complicated things which some people would like us to believe they are.

Now this man Kemeny, who co-invented BASIC, came from Hungary — the country which bore many famous men, such as Biro (who invented the Bic) and Colman (who was beaten at chess by a computer).

And lo and behold, not only did Kemeny and Colman share the same country but also the same desk at school and although Kemeny probably doesn't mention Colman's name at dinner parties as much as Colman mentions Kemeny, they were good friends.

One was a bit of a genius and topped his class in every subject. The other wasn't all that clever but at least he didn't have to be programmed to know what year he was born in.

In fact young Colman was smart enough to overcome his cashflow problems by setting himself up as a micro-insurance company. He was hoping to make a fortune insuring his fellow pupils against a bad mark in their exams.

The worse they were in each subject, the higher premium and people like Kemeny could name thier own price, which he did, paid up his premium and either had a black out or, realising these exams would be good ones to fail, did so and promptly put Colman out of business.

From there Colman and Kemeny went their separate ways. Kemeny went to America, to become a Professor of Mathematics and eventually to invent the BASIC language while Colman was still trying to learn the English language.

Only the other day, in 1963 to be precise, Steve Colman (then Managing Director of Pace Mowers) visited the Osaka Fair and saw a gadget on the Canon stand.

It was not a camera, it was a typewriter-size machine that could add, subtract, multiply and even divide in a matter of seconds. It was an unbelievable machine and he bought one. It cost 900 pounds at a time when a Holden car cost 1100 pounds.

People used to come to Pace Mowers just so see it and had anybody suggested then that a small and better calculator would be on everyone's desk, pocket or wrist, costing around $10, he would have been regarded the type of nut who now says that in years to come we will have no beer strikes six weeks before Christmas . . .

However, it was in 1979 that Colman discovered he could program a computer and, while not a mathematician, could logically work out a few simple things.

Soon after he had a micro-computer in business and wrote a few simple but useful programs, like recalculation of prices, import costings, profit and loss aportioning between various departments and many other time-savers. But even more important was the realisation that using a desktop computer could give him knowledge and information which could help in making decisions.

And it was this that made him realise that, while microcomputers may be used as toys, they are not that at all. They are as much part of the businessman's equipment today as the calculator.

The businessman who has no Apple or some other microcomputer with program like VisiCalc on his screen on his desk is just not using all the aids he has available.

It's no surprise that an old man like Steve Colman should believe in the future and decide to set up shop as a microcomputer retailer. He will try and use his business experience and combine it with the latest in micro technology. And at the same time he will enjoy living with the things that are to come (Colman's new shop is Computers Galore in Neutral Bay, Sydney).

Yet, he promises himself that he will never learn computers (BASIC being the last language he wants to learn), and he will want to sell solutions and not just equipment.

And, he says, that if John Kemeny (Prof Kemeny to you) doesn't like this absence of computerese, then he, Colman, will never again insure him, Kemeny, against bad marks in any examinations. Tough luck . . .

your APPLE computer

Peter Sandys

THE APPLE has a number of features you can use which are not well documented — the sort of features other makers emphasise greatly, like Commodore with the 8032's ability to set windows on a screen.

A few simple poke commands, for example, can set a window for a program to operate in on your Apple.

POKE32,X Sets left margin.
POKE33,X Sets width.
POKE34,X Sets top edge.
POKE35,X Sets bottom edge.

You can use any number within the screen boundaries for 'X' — obviously, the left margin can't be greater than 79,the width can't be greater than 80, the top edge can't be greater than 23 (line 23) and the bottom edge can't be greater than 24.

Here is a sample program:

```
5  HOME
10 POKE 32,10:POKE33,30:POKE34,10:
   POKE35,20:POKE37,11:rem set window
15 VTAB 11 REM TO FORCE FIRST LINE
              INTO WINDOW
20 PRINT "HELLO THIS IS A 20X"
30 PRINT "10 WINDOW FOR YOUR "
40 PRINT "PROGRAM TO DISPLAY "
50 PRINT "ITS OUTPUT IN,WITH-"
60 PRINT "OUT AFFECTING THE  "
70 PRINT "REST OF THE SCREEN "
80 POKE 32,0:POKE33,40:POKE34,0:
   POKE35,24 : rem sets screen
              back to normal
```

Instead of line 80 you can try '80 TEXT'.

High Line Numbers

Normally you cannot create a line number greater than 63999. However, if you try the following you can make a line which is listable but cannot be erased by normal means.

Take the program above (make sure you have saved it on disk or tape first) and then type:

PRINT PEEK(105)+PEEK(106)*256.

You will get a number which we will call N (in my case I got 2287 without the REM statements.) Now add a further line to your program. I added '10000 Rem PETER SANDYS'. Now type:

POKE N, 255: POKE N-1,255

When you list the program you will now see the line '65535 Rem PETER SANDYS' at the end.

By using other numbers instead of 255 at the poke stage you will get a variety of different line numbers. Now try to delete the line number 65535 — you can't...

On The Local Grapevine

Imagineering has left the retailing side of Apples and software and is concentrating on the distribution of software for the Apple and other machines.

It's a move which should improve the lot of all Apple owners as this will mean a better supply of programs at a better price for all. Imagineering has acquired software production rights for Online and Broderbund.

Microsoft has also set up a local distributor, Weiser-Microsoft. This also means better local support and better availability of Microsoft products.

Microsoft will also sell its own spreadsheet calculator program, called Microplan. I have seen the manuals and these look very promising. The features are, on paper, superior to Visicalc. I hope to evaluate the program soon.

In case you have noticed that software prices have risen lately its because our beloved friends (who don't have to pay it themselves) in the federal government taxation office have declared software is liable for a 17.5 percent sales tax.

Get those word processors going and send individual letters to members of parliament from yourself and any other enrolled voter who will back you and make it so painful for those MPs to have to reply to you that they have to buy an Apple or whatever to answer it all — then maybe they will be affected by that tax and will then get rid of it (and perhaps the import duty as well...).

...And From Overseas

Apple Computer has severed its contract with Computerland. Mike Markkula of Apple contacted each franchise of the chain explaining that Computerland Corporate's unwillingness to grant a standard location clause as required by Apple was the cause of the dissolution.

However a 90-day notice is required which expires on July 19. Computerland and Apple may solve their differences by then. Apple has encouraged individual stores to apply for a dealership in their own right.

There are problems for both organisations. In the past they have assisted each other, but the problem for Apple was that its own independent dealer network was threatened.

Apple wanted to give a dealer some breathing space when it came to marketing within a locality — it could control this by not appointing another dealership close to an existing one.

However, it did not have control over the Computerland franchise, which could open stores wherever it wanted.

Computerland, on the other hand wanted to be able to decide where it could offer franchises otherwise it would limit the value of the franchise scheme.

On the IBM front, Apple seems to have survived the threat with flying colours. According to friends in the US, Apple even went to print to welcome the IBM. David giving cheek to Goliath?. I believed Apple would not be affected because IBM would actually make personal computers respectable.

My feelings were borne out with the release of Apple's first quarter of 1982 figures in which Apple increased sales over the year before by 98 percent.

Some New Software

Versa Form is a very powerful database type program. The manufacturer claims it is more than a database, calling it a business forms processor.

I'm not sure whether that's an accurate description — but I do know it is one of the most powerful and easy to use database type programs I have come across.

It is professionally presented, both in documentation and in use. I gave it the no-manual test after a quick introductory reading of the instructions and was successful in using it.

I hope to review it in more depth later. In the meantime, check it out at your local dealer — it will be worth the time spent. It costs $440.

More Digitek News

Digitek is in the news again. A few months ago I told you of the advantages of the Pal colour card — well, finally the other cards in the range have arrived in Australia.

These cards are the Z80 expansion card, RS232 serial card, and parallel card. The 16K RAM card has been here for some time. The Z80 card is similiar to the Microsoft Z80 card except it does not include the CP/M operating system or MBASIC. Its cost is more favourable, at around $250.

The RS 232 card is also good value at $160. The parallel card is similarly priced.

The Ultimate 80-Column Apple?

By Peter Sandys

JUST WHEN we thought Apple 80-column cards had been developed to their finest — and, proudly, by an Australian company — along comes another board which has improved this concept.

Surprisingly, this board is also an Australian effort. The Digicard 80 is a product of Maclagan Wright and Associates and is by far the most advanced 80-column card on the market today.

When I was first introduced to the card I was rather sceptical. So what, I thought, 80-column cards are a dime a dozen. Reluctantly I investigated the board and happily my time was not wasted.

The card comes professionally boxed and with a fairly good manual; simple to read, not overly detailed, and well laid out. The cost of the Digicard is $350 (295 without tax). The card itself is well made and has all ICs socketed in on the board which is a good feature when it comes to troubleshooting a fault.

Slotting It in

The card is easily installed, using slot three and clipping a wire onto pin 24 of the keyboard encoder card. Logic probe clips are used to make the job easier. The card also supports the shift key upper/lower case modification without the need to use the paddle port.

An optional modification is the Hardware Graphics Toggle. This is required if you want to shift between high-res graphics and the 80-column text. This is more complicated, but again is achieved by the use of a logic probe clip.

The video output is good and it consumes far less power from the Apple than other 80-column boards. The immediate result is that you will have less problems with your monitor and the need to adjust the contrast/brightness between 40 and 80 columns. The characters are well formed and attractive. The cursor can be adjusted using a Control Z and S for slow flash rate, F fast flash rate, N disable, B block, U underscore cursor, and A which re-enables the default block flashing cursor.

Furthermore the cursor changes when you are in the lower case mode to a half-size block cursor. Another very nice feature is that when the cursor is over a letter it shows the letter in reverse field thus you can tell what is underneath and whether or not it needs changing.

The output is pleasing with the best character display set I have seen on an 80-column board. It should present no problem if viewed for any length of time. Special keyboard characters are available.

Another feature of the Digicard is the reverse linefeed and scrolling effect. In this you can move the cursor upwards until it reaches the top whereupon the entire display is scrolled downward. To activate the reverse linefeed you use CHR$(31).

One feature not found on the Apple or many 80-column boards is the underline character. This is done by printing a dash under the character from the line beneath. Whilst not being a true underline character it is a nice feature.

Instant 80-Column Listings

The Digicard defaults to 80-column listings, as distinct from other cards which require you to send a control code to set this up. The most startling effect is the speed of the listing in the 80-column mode — almost as fast as in 40 columns.

Window pokes are possible with the card (see my Apple Column for these). Pokes 32-35 can be successfully used to

Specifications and Report Card

Unit:	Digicard-80 card
Made By:	Maclagan Wright and Associates, Victoria
Processor:	6502 And Z-80 Compatible
ROM:	4K ROM
I/O:	Video output
Display:	80 x 24
Graphics:	Supports Apple screen, uses Applesoft commands to select between graphics and 80-column display.
Best Points:	Easy to use communications prompts, superior screen display, fast scroling with no screen flash, Macro Dos commands, reverse linefeed. Fully socketed IC's
Worst Points:	Shift key usable for only one upper case letter per press with Sandy's Word Processor.

Ratings:	**excellent**	**very good**	**good**	**poor**
Documentation:		✓		
Ease of Use:	✓			
Functionality	✓			
Support:	✓			
Value-for-money:	✓			

Extras included	Macro logon generator program
Options:	N/A
Price:	$350
Review Unit from:	City Personal Computers, Sydney

set windows on the screen.

Htab can be supported up to 40, Vtab the same as normal. If you want to Htab greater than 40 you can use Poke 36.

When using Applesoft basic the card has further advantages. Seventeen single key words are made available by pressing the escape key and another key at the same time.

This effectively gives you the equivalent of program function keys with DOS commands. These can be used in immediate mode or for writing programs, although they will only work when DOS is booted. The time this can save is enormous and it is indicative of the thought which went into the production of the card.

These words are: GOTO, POKE, HTAB, INPUT, LOAD, NEXT, LIST, RUN, SAVE, TAB(, CALL, VTAB, CHR$, GOSUB, RETURN, HOME, and CATALOG.

All other Esc key functions are still available like the edit keys I, J, K and M. These have not been affected by the Digicard.

The card will support two monitors as long as the hardware graphics lead is removed. One monitor is for 80-column text, the other for graphics.

Communications Can Be Fun

If you have ever had to work in communications mode you will realise that it can be rather tricky, particularly as the new Super Serial Card has created problems with other 80-column cards (these have been rectified in most, including the Vision-80 card).

The Digicard has allowed for the Super Serial card and the CCS serial card. When you move into communications mode (Ctrl-Z, C) you get a prompt message on the screen asking in what slot is your communications card. After answering this it comes up with a listing of the data and parity being used and what option you wish to choose. After choosing one of these you immediately enter the communications mode.

Once in Communication mode you can press Ctrl-shift W to get the prompt screen display. This display shows in reverse field the current status of whether or not the memory is on, full or half duplex, and the amount of memory left (max 35839).

DOS commands are accessible by Ctrl-shift D at which stage you can catalog a disk. By pressing Ctrl-shift L/S you can load or save the contents of memory as a text file.

Other commands allow you to examine memory, quit, reset memory, clear current contents, set/reset half or full duplex, transmit contents of memory via serial card, turn memory on or off and change baud rate.

The card can support a baud rate up to 4800. It is stated that rates higher, although possible are not guaranteed.

The makers have used the same key standards as the Vision-80 card, which is important as this will help keep a uniformity in approach — especially if software houses need to access these communications modes in their programs.

The makers claim it is compatible with PASCAL & CP/M. They say (I have not been able to test this) it will support GOTO X,Y as used in CP/M.

Creepy Crawlies...

So with all this power and the amazing features you may begin to wonder if there was anything that my rose-coloured glasses might have missed.

One problem (that is, if you are not made aware of it), is that if you initialise a disk in the 80-column mode you will not be able to boot it except whilst in the 80-column mode. Actually this could be a simple way of protecting some of the programs you have from others.

Another problem I found was with my word processor program — Sandy's. When I used the shift key to select upper case I could not hold it down to print a number of upper case characters together. I needed to release the shift key after each upper case letter.

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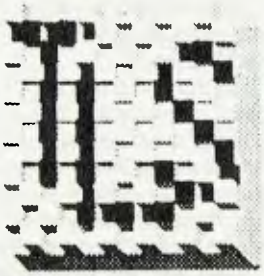

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LSI-033

your CP/M computer

By Bill Bolton

I'VE JUST received my third free update to CB-80. The latest version, 1.3, fixes some bugs but more importantly contains a library manager and a new linker which is based on the successful linker supplied with PL/1-80.

All registered users of CB-80 should have received their updates by the time you read this.

Still More CP/Ms

Digital Research has admitted it is working on CP/M for the Motorola 68000 microprocessor. This is for a Japanese 68000 based computer.

Details are few at this time but it will obviously maintain the CP/M file structures. DR is said to be considering doing a version of CP/M for the National Semiconductor 16016 chip.

The 16016 is an interesting chip. As well as its own 16 bit instruction set it has an alternative mode which will execute the 8080 instruction set. While this is worthy of note in itself from an architecture point of view the most intriguing aspect is the relationship to the 16032.

The 16032 is a 32 bit processor with a lot of nice features including the basic hardware capabilities to handle virtual memory. It has been described as a 'mini-VAX'.

The 16032 has an instruction set which is upward compatible from the 16016 (but not the 8080 mode) so there is now a possible path from CP/M-80 to a 'CP/M-32' with the 16016 as a transition step...it's an interesting possibility! Godbout/Compupro will have a 16032 IEEE-696 processor card out early in 1983.

MICSIG Conference

The Microprocessor Special Interest Group of the Australian Computer Society will be holding its National Microcomputer Conference in Canberra (at the ANU) from August 18 to 20.

The topic this year is microcomputer software and this 1982 convention looks like being a 'don't miss it' event. The conference is intended as a forum for both hobbyist and professional users.

I've had a preview of Dr Mark Wigan's paper on benchmarks and it is excellent. There are going to be many interesting papers presented and the equipment exhibition is always fascinating. Among the topics is Operating Systems and there could be some very interesting information to be had from those papers!

If you want details write to PO Box E237, Canberra, 2600 — and you'd better do it smartly too. See you there.

M-Drive Speed Comparison

As promised last time, here are the speed comparisons for the M-Drive...although first I should make some comments on the equipment used to obtain the figures.

The tests were done under CP/M 2.2 on my system which has a 7Mhz 8085 CPU (and uses an 8Mhz 8088 for some data transfers in the very highly optimised BIOS) and a fast double density DMA disk controller (a Godbout Disk 1) with YE-174 double-sided disks — in other words, it's pretty much state of the art in terms of 20 cm floppy disk-based systems. The hard disk is a Morrow M20 with a non-DMA controller.

The Godbout Disk 1 controller is a first class product. It is very fast and very reliable. It also has the capability of supporting several different cold boot routines onboard simultaneously. They are selectable by a DIP switch.

While this may seem irrelevant to most users it's this sort of hardware which supports the development of new software for new processors and that eventually benefits all of us. The ability to boot up into CP/M-80 on an 8085 or into CP/M-86 on an 8086 or into CP/M-68 on a 68000 with only the flick of a switch on a disk controller is the software developer's delight. It's no surprise to learn that much of the software development for the IBM PC was done on hardware from Godbout.

The first series of tests was done in two ways. Firstly with a 2D/2S floppy disk as the A: drive and with the assembler loaded off the floppy disk in all cases. The source file to be assembled was 20K long and HEX, PRN and SYM files were output onto the target disk being tested. The second way was identical except that both the assembler, source and output files were on the target disk. The assembler used was MAC.

As any assembler user knows there is a lot of disk activity when an assembler is running so that seemed a reasonable starting point.

Target Disk	Load from Floppy	Load from Target
FLOPPY	36 sec	36 sec
HARD	24 sec	22 sec
MDRIVE	13 sec	12 sec

The second test was done with the MBASIC 5.21 interpreter and this time the hard disk was not tested. A 24K ASCII source was loaded with the command line MBASIC SYSTEM. The times shown are for the 'Ok' prompt to appear. These tests were only done with loading both MBASIC and the source file off the target disk.

Waiting for MBASIC to load is something everyone tires of quickly so that seemed a reasonable test:

FLOPPY 18 secs
MDRIVE 9 secs

It should be noted that on the M-Drive most of the 9 seconds was spent displaying the signon message!

The third test was the compilation of a large BDS C program consisting of several sizeable, individual source files and the linking of those files with two additional CRL files and the libraries to produce a COM file.

A real 'production' test for me. This is the sort of thing I do a lot and speed improvements here are most significant:

FLOPPY 4min 50 sec
MDRIVE 2min 11 sec

The fourth test was the linkage of a REL file from the MBASIC compiler, using L80, to produce a COM file.

L80 seems not only to produce a lot of disk activity but also to produce an inordinately large number of head loads on my system so it seemed worth a try for the last test:

FLOPPY 72 secs
MDRIVE 36 secs

Some Conclusions

It seems that in terms of 'real' tasks that an M-Drive offers about two times speed improvement over a high performance floppy disk system. That's not all that great but it can be significant as the tasks get longer — such as the C compilation.

If you have a minifloppy disk system or a slow 20cm floppy system you would see very significant gains with a memory drive. If you are running a hard disk system it's probably not worth considering memory drives until the price/performance ratio improves quite a bit (with the way memory pricing continues to fall this may not be too far away).

There are some other aspects I found a little off-putting, though through no fault of the M-Drive.

I found many programs that I had previously considered quite satisfactory in terms of user feedback were frightening to run on the M-Drive. These programs rely on a certain amount of audio feedback via drive noises to let you know they haven't died but are still processing.

Even with my whisper-quiet hard disk I still get a little indication from its rustlings

that something is happening. M-Drives are totally quiet and sitting there looking at the signon prompt for an assembler while it goes away for three minutes with no indication of what's happening is an unnerving experience.

I'm certainly going to be writing many more visual feedback cues into my disk-bound programs from now on...

More Application Notes

It's time for more of the DR application notes — this time it's 'CP/M 2.2 Patch 02'.

ASM occasionally generates an erroneous phase error when the identifier in a SET statement appears within an expression from another statement. For example:

```
X       SET     1
Y       EQU     X
        END
```

Make sure you have a back-up copy of ASM.COM before using DDT or SID to make the following changes (the general methodology for using DDT to make these changes has been described previously in this column).

```
—L1DAD
        1DAD    CALL    1352
        1DB0    CPI     05
        1DB2    CNZ     20DD
—A1DAD
        1DAD    CALL    1B8D
        1DB0    .
—L1B8D
        1B8D    NOP
        1B8E    NOP
        1B8F    NOP
—A1B8D
        1B8D    CALL    1352
        1B90    ORA     A
        1B91    JZ      1DB5
        1B94    RET
        1B95    .
—G0
SAVE 32 ASM.COM
```

Configuring For Page Boundaries

This patch is from CP/M 2.2 Application Note 09. It modifies MOVCPM.COM to relocate on page (100H) boundaries rather than kilobyte (1K) boundaries. Changes are saved in a file named PGMOV.COM.

The first argument to PGMOV designates the size of the system in pages that PGMOV is to construct. This first argument is optional but if given *must* be in the range 64 to 255 decimal.

```
—L165
        0165    CPI     10
        0167    JC      0172
        016A    MVI     L,00
        016C    MOV     H,A
        016D    DAD     H
—S166
        0166    10      40
        0167    DA      .
—A16D
        016D    NOP
        016E    NOP
        016F    .
—L1A2
        01A2    ANI     FC
        01A4    MOV     A,H
        01A5    PUSH    H
        01A6    LHLD    0006
—A1A2
        01A2    ANI     FE
        01A4    .
—G0
SAVE 38 PGMOV.COM
```

NOTE: the above SAVE figure applies to a standard MOVCPM as supplied by Digital Research. If your CP/M came from your equipment supplier or Lifeboat Associates it is highly likely that the SAVE figure will be different.

Also, the address shown above may be slightly different — you may have to hunt around a bit with your debugger to find the exact code sequences shown above, although they should be there somewhere near the front of MOVCPM.

The Application Notes

The application notes as supplied by DR only apply to a 'stock standard' single density 20cm disk as supplied directly by DR. The addresses referred to in the patching information for the actual CP/M system image patches are somewhat dependent on this standard version (the patching addresses for the utilities are generally universal, however see the note below).

As I'm sure very few of you are actually running 'standard' 20cm single density CP/M systems this presents a problem. Most users will be running double density and/or minifloppy/hard disk based systems which will have different patch addresses from the standard version.

The code to patch will be the same but locating it will require a bit of hunting around to find the correct locations.

Since most of the remaining application notes I have relate to minor patches to the CP/M system image itself and the addresses will be different for most users, I don't intend to reproduce too many more of the notes.

You can get them for yourself in any case, as indicated two columns back. If you have the notes and have trouble understanding how to do the patching, write a letter to the editor and we may do a feature article on some of the internals of CP/M systems and how to reliably locate parts of the system. Since this is fairly technical information it wont be published unless there is a clearly demonstrated need (that is, lots of letters).

This is probably a good time to reiterate the point that SYSGEN and MOVCPM (also FORMAT and COPY if supplied) are not 'standard' utilities at all, though they are probably supplied with most CP/M systems and generally look the same to the user.

These utilities are rewritten for each set of hardware that supports CP/M by the hardware manufacturer or an independent vendor such as Lifeboat Associates.

The Remote CP/M System

The RCPM system is humming quietly away on the other side of the room as I write, with the 257th caller on line. User response has been very enthusiastic so far. Have you tried it yet?

The system has been totally stable for several weeks now and I'm sure the startup problems are behind us (thanks to the test users who put up with a lot of hassles in the first few weeks).

I've learnt a lot about data communications over the switched telephone network and about writing truly 'bullet-proof' software. I hope to be able to share some of the experiences with you in a feature article soon.

Several new volumes of CP/M software are expected from CP/MUG and SIG/MUG in the next few days and should be available for downloading from the system by the time you read this.

You can obtain the Connection Notes, six pages of advice on communications software, how to get the best performance from your acoustic coupler, what to expect to see, possible communications problems and, of course, the data format and phone number by sending a large (A4 size) SSAE to:

CP/M Bulletin Board,
PO Box 80,
Newport Beach, NSW, 2106

Feedback

Send your questions about CP/M to Bill Bolton, CP/M Column, YOUR COMPUTER, PO Box 21, Waterloo, 2017.

The All-Action Starfighter

By J Barker

your computer

OWNER REPORT

THE STARS slow their outward spread on the monitor and eventually stop; one more light-speed jump completed. The ship's computer is put on combat readiness and there's an almost-immediate reaction from the targeting computer.

A target, at 28000 units oncoming. The beam weapon is activated as a precautionary measure and the identification beacon activated.

At 23000 units the ship is taking hits at a distance too great to return fire. With dread the incoming beacon is read — it's as a PRC death caster. Two hits more and it's too late.

In the middle of preparing the craft for an emergency jump, the screen flashes white, then dramatically blank. Across the top comes the request from starbase central for a new pilot and starfighter.

From the catacombs of vast pyramids and temples, from the mind-twisting encounters in and on mansions, asylums and deserted islands, we have now been flung into the far distant future by Scott Adams and his team of adventurers.

This adventure takes the form of piloting an 'SC78503 Starfighter' which, according to the manual supplied, can be described as such: a drive capable light chase-attack fighter with advanced hypercharge weaponry.

If that sounds impressive, wait till you read the manual!

The software package contains two tapes. One is a simulator-cum-training aid, while the other is the actual main mission. Most important is the inclusion of the induction manual, which covers everything from pilot etiquette to self destruction. For the new pilot, this constitutes mandatory reading.

Before buying the game/adventure/space fantasy (yes it does cover them all), I had the simulator loaded at the store. It loaded easily after a small volume adjustment, and it was then that the fun began.

The simulator places you in a predetermined scenario with the villain or ally of your choosing. Unfortunately, even with the computer's helpful prompts, my lack of knowledge and skill soon assured me that this was no arcade target game. My demise was brought about rapidly by my own bungling and the ruthless enemy encountered.

Indeed, after purchasing the program and spending an impatient half an hour on the manual, was I only then ready to try another assault on the simulator.

Once on the main mission, the scope and complexity of the program comes into perspective. It is an adventure, swapping puzzles and riddles with tactics and planning.

There are eight 'Landbases' in the game numbered from zero to seven. From these you obtain bounty, fuel, recharges, overhauls and promotion if you're good, or demotion otherwise. Starting point is landbase central, where you also have the option of saving or loading a previous game.

It is from these bases that you operate your mission as a paramilitary policeman/mercenary, heading deep into space to search for and destroy the enemy.

The enemy, as the manual explains in its political environment brief, either belong to the Petro Resource Conglomerate — which is formally at war with the Solar Galactic Authority (SGA), the good guys — or there are other independent 'baddies'. They take the form of pirates or marauding star fighters.

The destruction of these craft is not easy and they come in seven different classes.

Each one comes complete with different shape, size, tactics, fire-power and manoeuvrability. Identification poses another problem as positive identification must be attained before attacking or leaving the area.

The incoming beacon may identify the craft as a star merchant, which it may well be — on the other hand, it could be a pirate-run vessel. You can never tell until the identification computer verifies the beacon, which it will eventually, or the target starts firing on you.

As stated before, this is no arcade-type 'Space Invader' simulation. Even so, your reflexes still need to be sharp and your strategy sound. Surprisingly the game's low-res graphics are impressive, clear, fast and well thought out.

Craft actually rotate, showing different sides, adding a nice touch and much realism to what is, after all, a fantasy.

Once visual contact is broken the targeting computer can be activated. This is a grid system not unlike the one seen on the illenium alcon of Star Wars fame. Using it, you can track your target without interruption. This is particularly useful in the many dogfights that occur.

Also from Star Wars is the 'Tie Fighter', known here as PRC Exxonerator.

On the nitty gritty side, Starfighter seems to be available from most Dick Smith stores and other major software houses. At the time of writing it cost a rather substantial $40, although after use value for money seems well balanced.

Though slightly complex (you don't expect flying a Starfighter to be easy!), practice makes improvements and, maybe someday, perfect.

I can recommend the program from around twelve years of age to adult.
So far I've found no bad points, except it's keeping me transfixed to the screen when I should be doing things like mowing the lawn or eating.

The good points are the obvious thought, work and imagination that has gone into this package. For example, even after learning to survive and pilot the craft, there is yet another challenge!

If you can reach the highest rank, the manual tells us that a secret password will appear. Send this password to the adventure team, and they will return a gift...

If you've ever wondered what it would be like to fly in Buck Rogers' or Luke Skywalker's starfighter, stop wondering. You can find out now, without the script and the camera, in your own adventure spacey.

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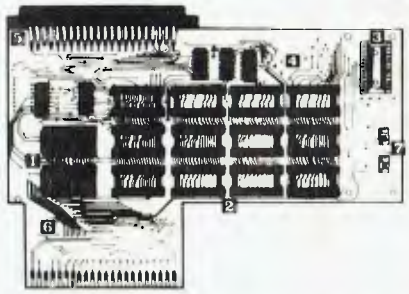

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your computer text file

Industry Comments

FRANKLY I am astounded at the results of my latest attempt to purchase a microcomputer either as a kit or built and tested.

Having followed the progress of the micro since the days of Electronics Australia's EDUC8 through the various stages — evaluation kits, hobby projects and so on, without actually becoming committed (mainly through concern over rapid obsolescence and lack of justification of cost), I finally decided (or thought I decided) to purchase the newest, most up-to-date device around.

I refer of course, to Applied Technology's Microbee. This kit appears to be the first on the market to be accompanied by a decent description of the construction and capabilities of both hardware and software — I refer to the 32-page supplement in the February 1982 edition.

Noting the order form small print advising would-be customers to check stocks before ordering, by phone, I went to the expense of a five dollar trunk call, only to be advised that no further orders were being accepted until April and that the built and tested version would not be available until June.

Now I ask you? Who in sane state of mind would go to the extent of launching a product without first having carried out proper market research and procured sufficient quantities of components and circuit cards to meet maximum envisaged short term demand?

Is everyone in the industry so concerned at the possibility of competitors beating them off the mark with later, better alternatives that they are prepared to forgo orderly marketing for small but certain immediate gain? Or do Australian companies lack the entrepreneurial skills to launch a full scale onslaught at the marketplace?

The immediate impact of the abovementioned situation on myself and perhaps many other potential purchasers, will be to look elsewhere. Waiting does not seem a wise decision in the current economic climate where dollar devaluation and sales tax impositions are possible at any instant.

I wonder what the fate is of the many customers who were unfortunate enough to overlook the small-print warning regards ordering and have forwarded order form and cheque by mail? One would hope that these orders are not being immediately converted to cash, so providing contribution to the company's cash flow, while leaving the customers with two months wait for delivery of the goods.

On reflection perhaps it is just as well I have been denied the opportunity of making an impetuous purchase for which I would have regrets later.

I would also like to take this opportunity of congratulating *Your Computer* on being the first Australian computer magazine truly orientated towards the user's viewpoint, with honest equipment and software reviews and discussions, critical where necessary and not just blindly promoting suppliers advantage points.

It is a pity that your approach has not yet generally filtered through to advertising in the industry.

PETER ELFORD
Jindalee, Qld

Oh, Those Keys...

THE ATARI 400 has given me great pleasure and has served as a good teaching device for learning BASIC.

I rate it highly with its high-res graphics (320 by 190 pixels), 16K RAM, 16 colours and three graphics modes for plotting of the actual character set, all of which are standard features. At the competitive price this is good news, especially if you only have a low budget such as a student.

But, unfortunately, 'life was not meant to be easy'. The touch-sensitive keyboard has left a lot to be desired compared to big brother, the Atari 800 with its conventional typewriter keyboard.

After reading an article in your April edition, by Graham Webber, I was enlightened by the introduction of a new push-button type keyboard for the Sinclair ZX80/81.

Here's the question. Do you think Atari will implement a keyboard of this type which, unlike the ZX80/81, could be fixed to the existing touch-sensitive one?

I've no doubts, with features such as this added to its expandable memory and a Pascal cartridge available (from what I've heard) in August, the 400 could be raised to 800 standard.

Bill Mallett
Durack, QLD

So far we haven't heard of such a mod, but we think the suggestion that it would help create a cheaper 800 ensures Atari's non-participation. Only an aftermarket supplier would happily make the company's bigger-profit model 'obsolete'.

The Key Features...

I AM SOON going to purchase my first microcomputer but I am having great difficulty deciding which one. I have $700.

I want a computer to learn to program, generally learn about micros, play games and learn (only if possible) another language such as Pascal, in that order. After reading *Your Computer's* article on buying second-hand microcomputers I decided it might be a good idea.

I was generally looking at four computers.

(i) A second-hand PET because it has (in my opinion) good expandability, support software and a good review from some people I know who own or have owned one. This costs around $650-$700 for an 8K model.

(ii) A new VIC-20 because it has colour. With the extra $300 I would get a cassette interface and recorder and memory to 16K.

(iii) A second hand TRS-80 Level II 16K for its expandability, software support and a game that is available for it ($650-$700).

(iv) A second-hand Super 80 Kit for it has 48K S-100 expansion and it only costs $400-$460. Putting the rest into modifications maybe towards an ASP stringy floppy (if there is one available).

Could you please tell me which one you would choose and why. What type of cassettes you would use. If you use a tape recorder storage and what type of tape recorder you would store it on.

BROCK TURNER
Artarmon, NSW

Unfortunately, we can't make up your mind for you. *Your Computer* **staff generally does not make specific purchase recommendations — we'd rather you made your own informed decisions after reading our assessments and comments on machines and relating that to your individual needs.**

If we came out and told you what to buy — based on our own preferences and needs — you'd hate us in a few months for steering you in the wrong direction.

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CROSS REFERENCE

Will list your basic program and print all of the variables used in the program. The line numbers following each variable are the lines on which the variable is used. The program also cross references all line referencing statements such as GOTO, GOSUB, ON-GOTO, ON-GOSUB, IF-THEN-ELSE, and RESTORE. You can easily determine if a line number is referenced by another part of the program.
The listing can be sent to the screen, the IBM parallel printer, or to a serial printer.

EXAMPLE: PROGRAM LISTING

```
820  Q$ = N$: J = 1: QL = 157
830  IF J> QL THEN Q = 0: RETURN
840  QM = (J + QL)/2
850  IF Q$<Q$ (QM) THEN QL = QM + 1: GOTO 830
860  IF Q$<Q$ (QM) THEN QL = QM - 1: GOTO
     830
870  Q = 1: RETURN
```

CROSS REFERENCE LISTING

```
2    830 FROM                 850  860
4    J ..................     820  830  840  850
1    N$ .................     820
2    Q ..................     830  870
3    Q$ .................     820  850  860
2    Q$( ) ..............     850  860
4    QL .................     820  830  840  860
5    QM .................     840  850  850  860  860
```

END OF LISTING **$24.95**

MINIMUM REQUIRED SYSTEM CONFIGURATION:
✓ IBM-PC WITH 48K MEMORY.
✓ 1 DISK DRIVE, DOS AND DISK BASIC.
✓ EITHER MONOCHROME OR COLOR/GRAPHICS

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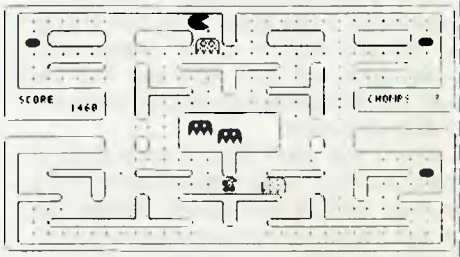

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ID. WEIRPOBOASHF

your computer tutorial

Understanding Assembler

Part VI

Last month we discussed block fills and moves; the next section of Les Bell's tutorial deals with string output and comparisons. All the examples given in this series are tested and reprinted from the original source code...

ONE OF THE most important functions of any program is output, since a program that doesn't output anything can hardly be said to do anything. In this chapter we are going to look at ways of outputting strings to a printer or video display.

If your computer has a memory-mapped video display, perhaps the quickest way to display a string is to block move it into the display using one of the routines described in the last chapter. If your output device is attached through an I/O port, we shall assume that there is an output routine provided somewhere in the system, either as part of a monitor ROM or as part of the CP/M BIOS, or whatever.

Most systems store strings internally in one of two forms: as a straight sequence of characters, terminated with a zero or other symbol (often '$'); or as a length byte followed by the string with no terminating character.

The first method is generally used for strings which are embedded in programs and do not vary in length, while the second is used for strings held in buffers. In fact, inside CP/M both methods are used: internal messages in the BIOS and transient programs are usually stored in the first way, terminated by a '$' sign, while the CCP (Console Command Processor) stores your command lines in an internal buffer in the second form.

String Encounters

Outputting strings of this kind is fairly easy; it's just a matter of stepping through the string, testing each character for the 'end of string' character, and outputting it if not. Here's how it's done:

```
; routine to output a string via bios calls

        org     0100h
outchr  equ     0d30ch  ; bios console output routine -
                        ; may be different on your sys.
outstr: lxi     h,str
oloop:  mov     a,m
        cpi     '$'
        rz
        mov     c,a
        push    h
        call    outchr
        pop     h
        inx     h
        jmp     oloop

str     db      'The quick brown fox','$'

        end
```

This is represented by the flowchart in Figure 1.

Important points to note: the fetching of each character from memory is performed by the mov a,m instruction. This transfers a byte from the location pointed to by HL into the accumulator.

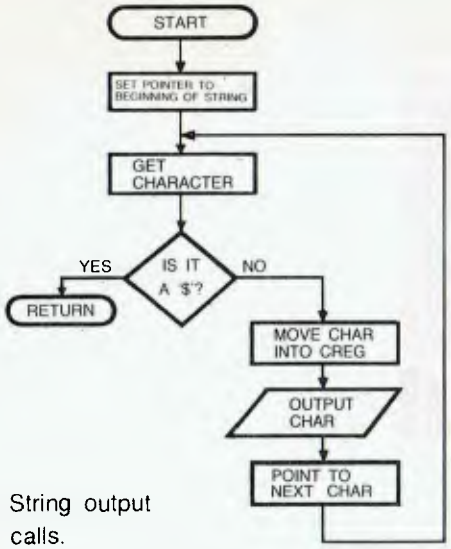

Figure 1. String output via BIOS calls.

This value is the compared with a '$' and the flags set accordingly. If the zero flag is set, then the contents of the accumulator is a dollar symbol, and the routine returns to the calling program, without printing the '$'.

Since HL is used to point to successive characters in the string, it must be preserfed during the bios call. This is done by pushing HL onto the stack and popping it off again after the bios call. HL is then incremented. Note that the bios expects the character to be output to be in the C register, and it is moved there with a mov c,a instruction.

If the string was terminated by a zero byte, then the cpi '$' instruction could be replaced by an ORA A instruction, which would set the flags to reflect the contents of the accumulator. Remember, a MOV instruction does not affect the flags!

Output by means of BDOS calls is slightly different. In this case, C contains the bdos function number, and the character to be output is in E:

```
; routine to output a string via bdos calls

        org     0100h

bdos    equ     0005h   ; bdos jump in page zero
conout  equ     2       ; bdos console out function

outstr: lxi     h,str
oloop:  mov     a,m
        cpi     '$'
        rz
        mov     e,a
        mvi     c,conout
        push    h
        call    bdos
        pop     h
        inx     h
        jmp     oloop
str     db      'The quick brown fox','$'

        end
```

This method has the advantage that the BDOS jump is always at location 5 in all CP/M systems, making for more portable code. It's a little bit slower, though you'd never notice it.

Of course, if you are using BDOS calls under CP/M, remember that there is a function (9) built in for string output, so you don't need a special routine at all:

```
; routine to print a string via bdos call

        org     0100h

bdos    equ     0005h   ;bdos jump in page zero
strout  equ     9       ;bdos string out function

outstr: lxi     d ,str
        mvi     c,strout
        call    bdos
        ret

str     db      'The quick brown fox','$'

        end
```

String Encounters of the Second Kind

In the second kind of string, the first byte of the string contains the string length (excluding the length byte) and the following bytes contain the string itself (see Figure 2).

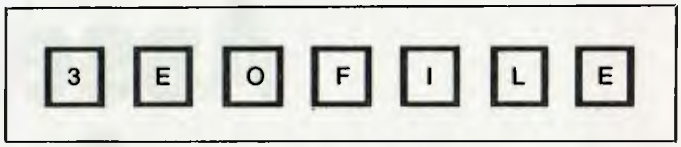

Figure 2. String with length indicator (in this example, the string is 'EOF' not 'EOFILE').

```
; routine to output a string via bios calls

        org     0100h

outchr  equ     0d30ch  ; bios console output routine

outstr: lxi     h,str   ; point to length byte
        mov     b,m     ; get it into b
        inx     h       ; point to first char
oloop:  mov     c,m     ; get char into a
        push    b
        push    h
        call    outchr
        pop     h
        pop     b
        inx     h       ; point to next char
        dcr     b       ; decrement character counter
        rz              ; return if no more chars
        jmp     oloop

str     db      stre - strb
strb    db      'The quick brown fox'
stre:
        end
```

Notice how this works: the first section of code loads the string length into b, which is used as a character counter. As each character is output, b is decremented until it reaches zero, when the last charactep has been output.

Another point is that we no longer have to move the character from memory into a to check its value, but can move it directly into c. Since b is being used as a counter, its value must be

preserved during bios calls, so it is pushed on the stack.

Finally, notice how we use the assembler to calculate the string length, rather than doing it manually. By labelling the beginning and end of the string text, we can let the assembler calculate the difference, which is the length.

The program for output via bdos calls is very similar, so we won't go into it here.

Character Searching

Searching for a single character is quite simple. Here's one way of searching through an area of memory, looking for a particular character:

```
; single character search

bdos    equ     0005h   ; bdos jump
spfunc  equ     9       ; bdos string print function

        org     0100h

srch:   lxi     h,start ; load HL with start of search area
        lxi     d,nd    ; load DE with end of search area
loop:   lda     schar   ; load A with search char
        cmp     m       ; compare
        inx     h       ; move to next byte
        jz      found   ; if match, go to found
        mov     a,e     ; get lsb of end address
        sub     l       ; compare with current position
        mov     a,d     ; get msb of end address
        sbb     h       ; subtract
        jm      nfound  ; if less, end of area
        jmp     loop    ; else keep trying
found:  lxi     d,fndmsg
        jmp     print
nfound: lxi     d,nfndmsg
print:  mvi     c,spfunc
        jmp     bdos

start   db      1,2,3,4,5,6,7,8,9
        db      10,11,12,13,14,15,16
nd      equ     $-1

schar   db      11

fndmsg: db      'Byte found$'
nfndmsg db      'Byte not found$'

        end
```

Points to note: the '$' symbol in the equate for nd represents the current value of the assembly pointer, in other words the current address. Thus nd will be set to $-1, the address of the last byte in the area being searched.

The printing of the final message is done by jumping to, not calling, the bdos. The reason for this is that once the message is printed, there is no need to return to the program.

Since we jumped to the bdos, when it returns, it will return not to the program but to the ccp (console command processor), which originally called our program. This will become clearer when we study the stack in the next section.

The best way to understand this program is to step through it

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using DDT, and changing the value of the byte being searched for so that it will or will not be found.

String Compares

Before we can start searching for strings we must be able to compare them, so that we can tell whether we've found the right string or not.

In this example, I'll take the case of a compiler checking to see whether the word it has come to is a keyword or not.

The compiler will have a table of keywords, each terminated with a null (zero) byte. Thus the comparison consists of checking each letter in turn of the two strings until either they don't match or we reach the zero at the end of the keyword, in which case we have found a match

Here's the code:

```
; match byte sequence with null-terminated word
; pointed to by DE

bdos    equ     0005h
spfunc  equ     9

        org     0100h

        lxi     h,bytes ; input text to scan
        lxi     d,word  ; keyword to compare
loop:   ldax    d       ; examine next letter of keyword
        ora     a       ; is it zero?
        jz      match   ; if yes, we have a match
        cmp     m       ; compare it with text
        inx     d       ; move to next letter
        inx     h       ; on text and word
        jz      loop    ; ok so far, else
        lxi     d,nmmsg ; print no match message
print:  mvi     c,spfunc
        jmp     bdos
match:  lxi     d,matmsg    ; print match message
        jmp     print

nmmsg   db      'No match$'
matmsg  db      'Match found$'

bytes   db      'INPUT A$(1)'  ; typical input text line
word    db      'INPUT',0      ; keyword to compare

        end
```

This is really fairly straightforward. As before, the best way to understand it is to DDT it — and in any case, the experience with DDT will stand you in good stead when debugging your own programs.

Homework time. Notice that in the single character search routine, the test for equAlity is performed by a single instructiOn (cmp m). A string search routine can be written by replacing that instruction with the string compare subroutine.

Bear in mind that these two routines use the HL and DE registers for different purposes, so temporary storage will have to be arranged for values. I'll show one way of doing it next month, but you might like to try it yourself before then.

Next month we'll move on to an investigation of the stack pointer. □

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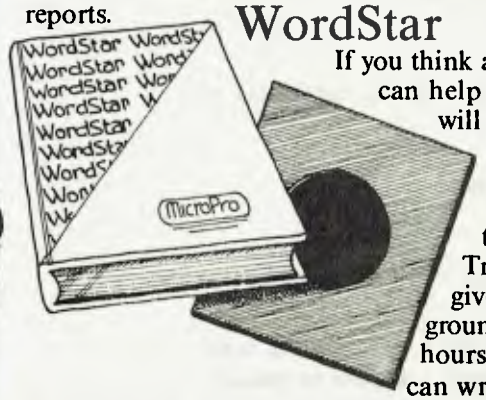

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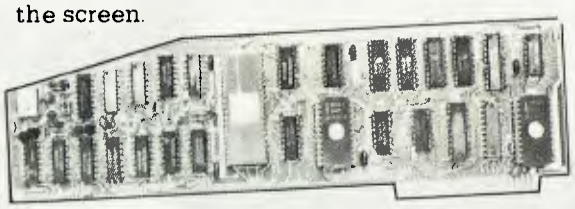

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OWNER REPORT

WHEN I first purchased my TRS-80 Model I computer almost four years ago, printers were neither fancy nor cheap; consequently, I simply 'made do' without one.

Later on, with my system considerably expanded to include extra RAM and disks, I felt justified in spending a small amount on a Centronics Microprinter using aluminium-coated paper, but I had no illusions about its utility for anything more ambitious than listing programs.

About 12 months ago, however, one of the applications I was writing demanded high-quality printed output that could be clearly copied for a stencil-making machine. Dot matrix printers in general seemed to fall short of the standard I needed, yet I couldn't afford anything in the daisywheel class. And then I found the Epson MX-80.

Perhaps found is not the right word for it, because at that time the MX-80 was so new to Australia that it wasn't even possible to lay eyes on one before ordering.

I had taken my problem to the people at a microcomputing store in Sydney, and they waxed so enthusiastic about the Epson and it's features that I walked out with a brochure, a receipt or my deposit, and a slight I-hope-it's-all-they-say feeling. I needn't have worried.

Getting Physical

The MX-80 when set up is approximately 11cm in height, 40cm in width, and 37cm in depth, with a weight of around 5.5kg.

Mine came complete with power cord, paper separator, and operation manual; also needed, of course, is a cable to connect the printer to your computer. The printer mechanism used was developed by Japanese firm Shinshu Seiki (associated with the Seiko watch people), and is housed, together with the control circuit board and power circuit, in a robust off-white plastic case. Controls and switches are straight-forward — power on/off, on line/off line, form-feed, and line-feed, plus appropriate status lights.

Paper width can range between four and ten inches. Tractor-type pin feed is used on mine, although more recent models also allow for friction feed, which is particularly useful for single sheets such as letterhead stationary.

Print method is serial impact dot (9x9) matrix, with a nominal speed of 80 characters per second. Performance is enhanced via a head which is both logic-seeking (able to compute which is the best direction to move before starting a line), and bi-directional (able to print while travelling in either direction).

The standard interface supplied is Centronics-style 8-bit parallel (which suits the TRS-80 perfectly), but RS232 (serial) is also available.

One point worthy of particular mention is that the MX-80 can run in either of two basic modes, selectable by DIP switch at the rear of the unit — standard MX-80 mode, and TRS-80 mode.

Surprisingly, although the latter mode allows easier use of TRS-80 graphics, most TRS-80 users would be better advised to choose the former, because a number of the printer's special features are available only from that mode.

Print Features

The MX-80 brochure advertises 'correspondence quality printing'. Then again, most printer manufacturers would have you believe that, wouldn't they?

Beauty, it has been said, is in the eye of the beholder, and obviously print quality is a fairly subjective thing — what I find acceptable may not be good enough for your requirements.

Nevertheless I believe the MX-80, while not purporting to compete with the daisy-wheel printers (which are considerably more expensive anyway), comes close to its makers' claims. This is achieved by multi-pass and multi-strike techniques which, in combination with the choice of 40, 66, 80, or 132-column printing, provide no less than twelve distinct variations in the way your output can be presented.

Beside the standard print mode, facilities exist to double-print (advance 1/206 of an inch and repeat the line), emphasise-print (shift right and double strike), or a combination of both, The emphasised mode certainly solved my original problem.

The full 96-character ASCII set is, of course, supported, with true descenders (the 'tails' on letters like g, j, and q extend below the line).

TRS-80 graphics are also available, although their use from MX-80 mode (see earlier note) requires adjustment of the ASCII values thereof.

All the special features can be invoked from software simply by outputting the relevant ASCII control codes to the printer; these include variable line spacing and form length, horizontal and vertical tabbing, and the various print modes mentioned previously.

Reliability And Service

Actually, I'm hardly qualified to talk about MX-80 servicing; in thirteen months of fairly constant usage, originally with my Model I TRS-80, and now with a new Model III, the printer has performed flawlessly.

Early in its life I took the precaution of buying a spare print head (the head can be replaced simply by snapping out the old and snapping in the new), but it hasn't been needed. I've changed the ribbon during that period of course, but that too is child's play; the replacement comes in cartridge form.

The Epson incorporates a self-test mode for use if you have reason to suspect a problem. Depressing the Line Feed switch while powering the printer on automatically engages a comprehensive test pattern covering all possible characters.

The Verdict

First, some minor criticisms:

- At around $15, the cost of a replacement ribbon is a bit steep for the home user! That, of course, is what you pay for the convenience of cartridge against messy ribbon. However, I recently noted an American advertisement for cheap ribbons (minus the cartridge) for those who don't mind getting their fingers black, so perhaps we'll see those in Australia.
- The manual that came with my printer is perhaps a little technical for the average user; all the information is there, but patience is required to select out the pearls of wisdom from the 'buzzwords'. Fortunately, Epson recognised this fact and engaged Dr David Lien, who wrote the original TRS-80 Level I Manual, to produce a more readable book. I'm hoping that will be available here before long.

Having gotten those comments out of the way, I'll finish with this: the Epson MX-80 is a medium-priced, high-quality printer with a wide range of features that make it stand out from the crowd (why else would IBM select it as standard equipment for its personal computer?).

It is both simple in design and (in my experience) reliable in the field. And in combination with a good word processor (I'm using David Welsh's superb Lazywriter), I believe it is capable of being a most valuable business tool. □

Low-Cost Letter Quality Centronics 739

PRINTER reviews are just about the last thing we need in the *YC* office — for a start, printers are boring (being mechanical devices...), but more significantly they're usually quite difficult.

The testing isn't hard, but setting up can take minutes, hours, days — even weeks, as we recently discovered. One printer that came in for test two issues ago still won't install for our equipment!

It's okay to simply buy a printer to suit your machine, but when you have to set them up one after another to run with computers they may never have been connected to it can be real trouble. Interfaces, cables, dip switches, hidden controls and, of course, that one last 'secret' mentioned briefly on page 93 of the operator's manual.

Then you have to figure out the control codes, and how to send them...no wonder we cringe every time a fresh carton is delivered to the office door.

There's an occasional exception, and the recent one was the Centronics 739. We were stunned when we opened the box to find full instructions, the right cable, a matching interface — everything we needed. It even had paper, already in the machine!

The people at The Logic Shop, which supplied the test unit, had certainly done their homework; we only had to plug it in and we were up and running.

It's performance at that stage did nothing to sour the image, either; it's a very capable machine, with several advantages (and one or two disadvantages, of course) over other printers in the price range.

It features a useful range of type faces, from condensed to underlined to enlarged, with a host of combinations between. Perhaps the most interesting — and unusual, in this price class — is the high-density proportionally spaced 'correspondence quality' mode.

In normal operation, at 100 characters a second (burst speed), it prints an average quality dot matrix typeface. It has proper descenders, but isn't quite up to the standard of the Epson MX80/1•• series. Switched into proportional mode, however, it produces a high-quality print that is

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RAM:	2K buffer (serial version)
I/O:	Parallel (serial available)
Best points:	Proportional print quality, graphics, three-way paper handling
Worst points:	Fixed-width tractor, no front panel power-on light

Ratings:	excellent	very good	good	poor
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Ease of Use		✓		
Functionality		✓		
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Options:	Serial interface
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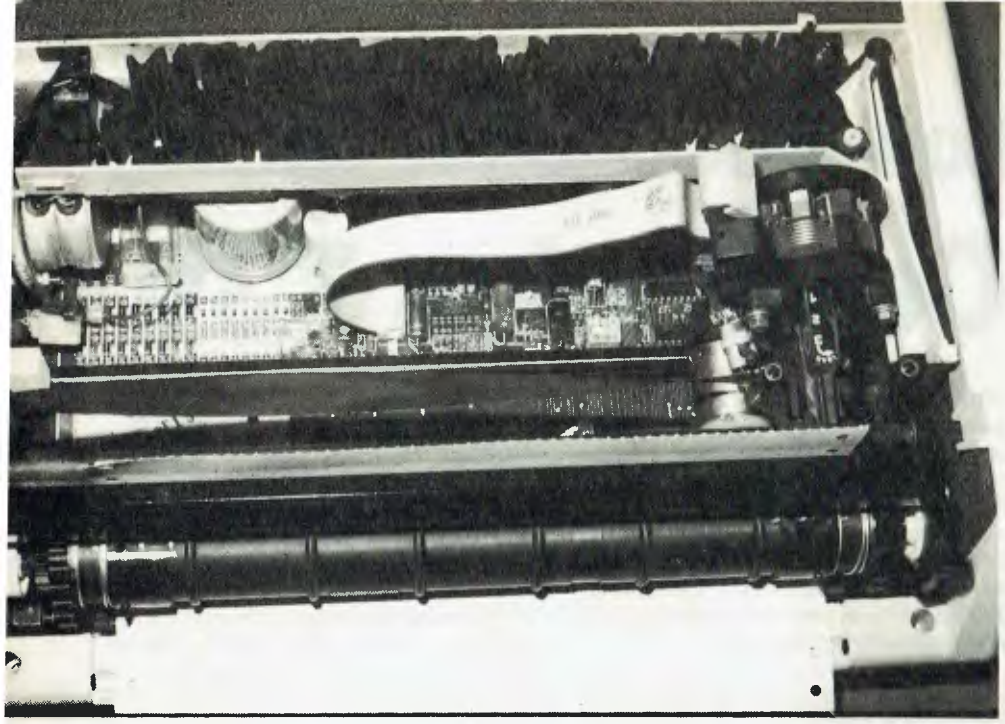
Review unit from:	The Logic Shop, 212A High Street, Prahran 3181



attractive indeed. The proportional type is available in enlarged print mode as well.

Speed is reduced around 20 percent when printing proportionally — not enough to really matter.

Other features not generally available in this price range include line feed/reverse line feed combinations to allow super- and sub-scripting, right justification of text performed by the printer itself, underlining, and three-way paper handling (tractor feed, roll feed and sheet feed).

One drawback here is the fixed width tractor-feed sprockets — while they're adjustable for minor differences in widths, they basically accept only 22cm (8.5 inch) paper. The only time that might prove to be a problem, though, is if you're in the habit of printing address labels on single width stationery.

The 739 is surprisingly compact and light (5.4 kg), so it's an easy job to sling it under one arm and carry it about with you. It is also very quiet when 'idling', and we often found ourselves looking under the cover at a circuit board LED to see if it was powered up.

It would be a little better if that LED was fitted to the front of the machine, near the controls. Incidentally, these cover power on/off, online/local and paper forward/reverse. There is no specific form feed switch, although holding the paper advance button on will whip it through quickly; if you overshoot top-of-form, you can reverse to it anyway.

Software selection controls typeface, (from condensed to enlarged in several modes), dot spacing between letters, reverse line feeds, half line feeds (both forward and reverse), enabling of graphics, underlining and backspacing.

It has multiple character styles for different countries, selectable by dip switch, a self-test function, and 74 by 72 dots-per-inch pin-addressable graphics.

Standard interface is Centronics parallel, although a serial version is available with a 2K buffer, XON/XOFF protocol, and baud rates up to 19,200. The serial version costs $1225 before tax, compared to $1165 for the standard model.

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SYSTEM 80

System 80 Suicide

By Tony Hinde

THIS program is written on a System 80 and simulates a car going the wrong way down a one way street; you're the driver.

It is a fast short program written with remark lines in between so they can be deleted easily.

The left arrow key moves your car left and the right moves it right. One collision ends the game.

```
10 CLS:
    CLEAR100:
     RANDOM:
      B=30:
       K=153:
        Y=70
15 'CHECKS IF YOU WANT TO MOVE \/
20 X=X+.1:
    IFPEEK(15359)=64THENY=Y+3ELSEIFPEEK(15359)=32THENY=Y-3
25 'MAKES SURE YOUR CAR STAYS ON THE SCREEN \/
30 IFY>126THENY=126ELSEIFY<0THENY=0
35 'SETS THE CAR AND CHECKS IF YOU CRASHED \/
40 SET(Y,0):
    SET(Y+1,0):
     IFPOINT(Y,1)=-1ORPOINT(Y+1,1)=-1THEN100
50 H=RND(3):
    IFH=2THENG=191:
      K=153ELSEG=128:
       K=166
55 'PRINTS THE TRACK AND THE OTHER CARS \/
60 F=RND(9):
    PRINTSTRING$(B-1,K)CHR$(149)STRING$(F,128)CHR$(G)STRING$(9-F,128)CHR$(170)ST
RING$(52-B,K)
65 'MOVES THE ROAD \/
70 D=RND(11):
    IFD<6THENC=-1ELSEIFD>6THENC=1ELSEC=0
80 B=B+C:
    IFB<1THENB=1ELSEIFB>52THENB=52
90 GOTO20
95 'FOR WHEN YOU CRASH \/
100 FORU=1TO50:
      POKE15360.5+Y/2,127:
       POKE15360.5+Y/2,128:
        POKE15360.5+Y/2,127:
         NEXT:
          CLS:
           PRINT" YOU TRAVELLED"X"KILOMETERS":
            PRINT:
             PRINT"WOULD YOU LIKE TO TRY AGAIN ?"
110 L$=INKEY$:
    IFL$=""THEN110
120 IFL$="Y"THENRUNELSEIFL$="N"THENENDELSEGOTO110
```

APPLE

The Wriggling Snake

By M J Smith

THIS IS A game where you control a lengthening snake, and have to hit a small target.

The quicker you hit a target, the more points you get. But if you take too long, it will disappear to a new spot, and you lose five points.

The game is written in Applesoft BASIC. To keep the program simple, the tail of the snake doesn't shorten, but the game proved to be almost impossible.

So, to provide some room to move, two black lines are plotted across the screen (lines 1050, 1060), whenever the target gets hit or disappears. Also, the game had to be slowed down, because the snake was too hard to control, and there is a short pause in line 170.

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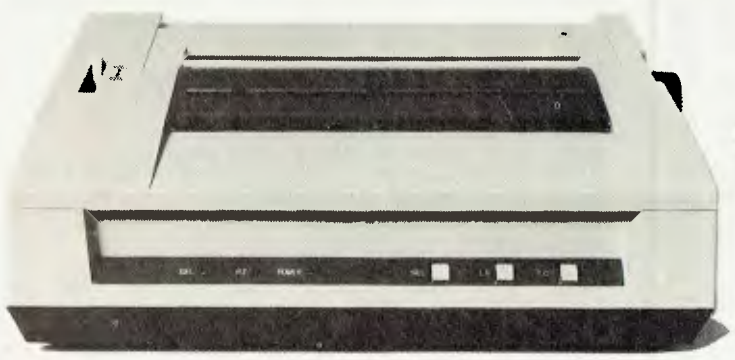

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```
 1  REM                        SNAKE
 2  REM                  M.J.SMITH 4/4/1982
 3  REM
 4  REM
 5  REM  TO MOVE,USE THE TWO ARROWS WITH
 6  REM  'A' AND 'Z' FOR UP AND DOWN.
 7  REM
 10  PA = 60: REM  SET SPEED
 30  X = 2:Y = 2: REM SET STARTING POINT
 40  GR : COLOR= 2
 50  XX = 1:YY = 0: REM   SET START DIRECTION
 55  REM  DRAW BORDERS
 60  HLIN 0,38 AT 0: HLIN 0,38 AT 38
 70  VLIN 0,38 AT 0: VLIN 0,38 AT 38
 90  GOTO 1000
100  REM  ** MAIN LOOP **
110  COLOR= 1
120  X = X + XX:Y = Y + YY: REM     UPDATE PLOTTING VALUES
130  XY =  SCRN( X,Y): REM    GET   COLOR OF SQUARE LANDED ON
140  COLOR= 1
150  PLOT X,Y: REM  PLOT NEW HEAD
160  G = G + 1: IF G > 70 THEN 900 : REM   TOO LONG TO HIT TARGET
170   FOR I = 0 TO PA: NEXT : REM  PAUSE
180  IF XY = 1 OR XY = 2 OR XY = 12 THEN 260: REM  XY = COLOR OF SQUARE
190  A =  PEEK ( - 16384): IF A < 128 THEN 120: REM  NO KEY PRESSED
195  REM    FIND KEY PRESSED AND CHANGE DIRECTION
200  IF A = 136 THEN XX =  - 1:YY = 0
210  IF A = 149 THEN XX = 1:YY = 0
220  IF A = 193 THEN YY =  - 1:XX = 0
230  IF A = 218 THEN YY = 1:XX = 0
240  POKE  - 16368,0
250  GOTO 100
260  IF XY = 2 OR XY = 1 THEN 5000: REM  SPLAT
270  IF XY = 12 THEN 6000: REM  HIT TARGET
900  G = 0:SC = SC - 5: PRINT : PRINT : PRINT : PRINT " SCORE : ";SC
910  COLOR= 0: PLOT TX,TY:
1000 REM  ** PLOT TARGET **
1010 G = 0
1020 TX =  INT (37 *  RND (1)) + 1
1030 TY =  INT (37 *  RND (1)) + 1
1040 IF  SCRN( TX,TY) <  > 0 THEN 1020: REM  SQUARE OCCUPIED
1045 REM   CUT UP THE SNAKE
1050  FOR I = 1 TO 3: COLOR= 0: HLIN 1,37 AT 36 *  RND (1) + 1: HLIN 1,37
      AT 36 *  RND (0) + 2 : NEXT
1060  FOR I = 1 TO 3: COLOR= 0: VLIN 1,37 AT 36 *  RND (1) + 1: VLIN 1,37
      AT 36 *  RND (0) + 2 : NEXT
1070 COLOR= 12
1080 PLOT TX,TY
1090 GOTO 190
5000 REM  ** SUBR. FOR SPLAT **
5005  FOR SO = 1 TO 200:S =  PEEK ( - 16336): NEXT
5010 LIVE = LIVE + 1: IF LIVE = 3 THEN 5030: REM  NO LIVES LEFT
5015 POKE  - 16368,0 : REM RESET KEYBOARD
5020 GOTO 10
5030 TEXT : HOME
5040 IF SC > HS THEN HS = SC : REM TEST FOR NEW HIGH SCORE
5050 PRINT : PRINT : PRINT "HIGH SCORE : ";HS
5060 PRINT : PRINT "YOUR SCORE : ";SC: PRINT : PRINT : PRINT
5065 POKE  - 16368,0
5070 PRINT "DO YOU WANT ANOTHER TRY? ";
5080 GET A$
5090 IF A$ = "N" THEN  END
5095 REM  CLEAR VARIABLES FOR NEXT GAME
5100 SC = 0:X = 0:Y = 0:XX = 0:YY = 0:XY = 0:LI = 0: GOTO 10
6000 REM   SUBR. FOR TARGET HIT
6003 REM  SOUND FOR HIT
6005  FOR I = 1 TO 5
6010  S =  - 16336
6020  K =  PEEK (S):K =  PEEK (S):K =  PEEK (S):K =  PEEK (S):K =  PEEK
      (S):K =  PEEK (S):K =  PEEK (S)
6030  NEXT
6040 SC = SC + 70 - G: REM  ADD ON POINTS - TIME TO HIT
6050 PA = PA - 5: REM  REDUCE PAUSE
6060 PRINT : PRINT : PRINT : PRINT " SCORE : ";SC
6070 GOTO 1000
```

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MBASIC Pretty-Print

By Jeff Richards

THIS PROGRAM permits users of Microsoft's BASIC-80 (MBASIC) to print programs in an improved format. The procedure also applies to any program that can be stored in the same form as it appears on the screen.

The changes in format are:
- Line numbers are aligned.
- FOR-NEXT loops are indented.
- REMarks are separated by a line feed, and the REM and line number are stripped off.
- Page length can be specified.
- A heading can be printed at the top of each page.

The program permits three forms of output. The listing can be sent to the screen, but this is unlikely to be of much use except perhaps for previewing the printed output. Second, the program can be sent straight to the printer, in which case page length and page heading can be specified.

Finally, the program can be sent to a disk file, again with page length and heading specified. Such a file could be printed under an operating-system utility, or it could be used as input for a word processor if changes are required. It will be created with a name the same as the file being listed, but with a '.PRN' suffix.

To use the formatting program the program to be printed must be saved in ASCII form; that is, with the ',A' option.

The program will look for the nominated file with a '.BAS' suffix and will report an error if it cannot be found. It then asks where the output is to go, and if 'printer' or 'file' is selected will ask for page length and page heading.

The heading will be centred with the file name on the left and the page number on the right. The accompanying listing was printed with the formatter program.

The program could be converted to other BASICs, but will only work if the program to be printed is stored as an ASCII image of the screen display.

The only non-standard command is the RSET at line 1060. This right justifies STR$(K) into the six character string J$, which has been set to all spaces. This procedure can be replaced with a small loop that pads the string value of K with spaces to the left until it has a length of 6.

The searches for the keywords 'FOR', 'NEXT' and 'REM' may also have to be changed slightly, as in MBASIC these can legally be part of variable names.

This program should prove useful in those circumstances where style is important — as in the archive hard-copy programs, or when changing or publishing programs in list format.

```
B:PPRINT            PRETTY PRINT FOR MBASIC

     ***  PPRINT      MICROSOFT BASIC-80 V5.2
     ***  DISPLAY OR PRINT PROGRAM FILES WITH ENHANCED LAYOUT.
     ***  PROGRAM FILE MUST HAVE BEEN SAVED WITH 'A' OPTION
     ***  IF 'FILE' OPTION IS SELECTED PRINT IMAGE IS SENT TO
     ***  A DISK FILE CALLED "program-name.PRN".
    60 DEFINT A-Z
    70 CLS$=CHR$(26)
   100 PRINT CLS$;
   110 INPUT "INPUT FILE NAME = ",J$
   120 IF J$="N" THEN SYSTEM
   130 F$=J$+".BAS"
   140 ON ERROR GOTO 3000
   150 OPEN "I",#1,F$
   160 INPUT "SCREEN * PRINTER * FILE =",P
   170 IF P=1 GOTO 320
   180 IF P=2 GOTO 220
   190 IF P<> 3 GOTO 160
   200 F$=J$+".PRN
   210 OPEN "O",#2,F$
   220 F$=J$
   230 INPUT "PAGE LENGTH = ",LENG
   240 IF LENG<2 GOTO 230
   250 PAGE = 0
   260 INPUT "COMMENT FOR HEADING LINE = ",J$
   270 C$=SPACE$(60)
   280 J$=LEFT$(J$,58)
   290 MID$(C$,30-LEN(J$)/2,LEN(J$))=J$
   300 J$=""
   310 GOSUB 2040
   320 LINE INPUT #1,I$
   330 GOSUB 1000
   340 IF EOF(1) THEN GOTO 360
   350 GOTO 320
   360 CLOSE
   370 GOTO 110

     ***  SUBROUTINE TO PROCESS EACH LINE
  1000 FOR I=1 TO LEN(I$)
  1010   K=ASC(MID$(I$,I,1))
  1020   IF K=32 THEN GOTO 1040
  1030 NEXT I

B:PPRINT            PRETTY PRINT FOR MBASIC                PAGE  2
  1040 K=VAL(LEFT$(I$,I-1))
  1050 J$=SPACE$(6)
  1060 RSET J$=STR$(K)
  1070 FOR J=1 TO LEN(I$)
  1080   IF ASC(MID$(I$,J,1))>57 THEN GOTO 1100
  1090 NEXT J
  1100 K$=RIGHT$(I$,LEN(I$)-J+1)
  1110 IF LEFT$(K$,5)="NEXT " THEN FORC=FORC-1
  1120 IF FORC<0 THEN FORC=0
  1130 J$=J$+STRING$(1+FORC*2,32)
  1140 J$=J$+K$
  1150 IF LEFT$(K$,4)="REM " THEN R=R+1 ELSE R=0
  1160 IF R>0 THEN MID$(J$,1,10)=CHR$(10)+"     *** "
  1170 IF R>1 THEN MID$(J$,1,1)=CHR$(0)
  1180 GOSUB 2000
  1190 IF LEFT$(K$,4)="FOR " THEN FORC=FORC+1
  1200 FOR I=4 TO LEN(K$)-4
  1210   IF MID$(K$,I,5)="NEXT " THEN FORC=FORC-1
  1220 NEXT I
  1230 RETURN

     ***  PRINT & UPDATE LINE COUNT
  2000 IF P=1 GOTO 2100
```

```
2010 LIN=LIN+1
2020 IF ASC(J$)=10 THEN LIN=LIN+1
2030 IF LIN<LENG GOTO 2100
2040 PAGE=PAGE+1
2050 LIN=2
2060 K$=J$
2070 J$=CHR$(12)+F$+C$+"PAGE "+STR$(PAGE)+CHR$(10)
2080 GOSUB 2100
2090 J$=K$
2100 ON P GOTO 2110,2120,2130
2110 PRINT J$:RETURN
2120 LPRINT J$:RETURN
2130 PRINT #2,J$:RETURN

   ***  DEAL WITH ERROR IN OPENING FILE
3000 IF ERR<>53 THEN GOTO 3040
3010 PRINT"FILE NOT FOUND"
3020 CLOSE
3030 GOTO 110
3040 ON ERROR GOTO 0
```

USCD Pascal

Pascal Disk-Reader

By Hank Cooper

APPLE Pascal operates on a block system for its disk reading and writing routines. The program presented here reads any of the 280 blocks on a Pascal disk and displays the 512 bytes of that block in numerical sequence. This format display both Hexadecimal and Alpha/numeric information.

On entering the program you are asked to specify certain setup parameters required for the output of the program. You choose Unit (drive) for disk read, block to be read (0..279) and format instructions (8 or 16 bytes/line).

Any bad I/O or input which is out of range results in the questions being repeated.

The next step is for you to open an output file to dump the information. If the device you specify isn't on line the file will have to be re-specified. On successful completion of this section the information will be shown.

Once displayed you either repeat(and hence re-specify setup parameters) or quit. This program has been used by me to see how the single-blocked file SYSTEM.MISCINFO is structured, to obtain file information from the directory blocks (2..5), and to see what setup parameters are required by SYSTEM.EDITOR (contained in the first two blocks of all .TEXT files).

```
(*$G+,R-,I-*)
PROGRAM EXAMINE ;
LABEL 1111 ;
CONST
  SPACE=' ' ;
VAR
  BUFFER                  :PACKED ARRAY [1..512] OF 0..255 ;
  CHR_BYTE                :PACKED ARRAY [0..  1] OF CHAR ;
  HEX_ARRAY               :PACKED ARRAY [0.. 15] OF CHAR ;
  OUT_PUT                 :FILE OF CHAR ;
  COUNT1,COUNT2,FORMAT    :INTEGER ;
  IN_UNIT,CHOICE,BLOCK    :INTEGER ;
  CONTROLTEST             :CHAR ;


    PROCEDURE SETUP ;
    BEGIN
      REPEAT
        WRITELN(CHR(12)) ;
        WRITE('ENTER THE UNIT NO. FOR READ ') ;
        READLN(IN_UNIT) ;
        WRITELN ;
        WRITE('ENTER THE BLOCK NO. FOR READ ') ;
        READLN(BLOCK) ;
        WRITELN ;
        WRITELN('ENTER THE FORMAT PARAMATER 8/16 ') ;
        WRITE('BYTES PER LINE ') ;
        READLN(FORMAT) ;
      UNTIL (IN_UNIT IN [4,5])    AND
            (BLOCK   IN [0..279]) AND
            (FORMAT  IN [8,16]) ;
      REPEAT
        WRITELN(CHR(12)) ;
        WRITELN ;
        WRITELN('SELECT ONE OF THE FOLLOWING- ') ;
        WRITELN ;
        WRITELN(SPACE:10,'< 1 > ''REMOUT:  ''') ;
        WRITELN(SPACE:10,'< 2 > ''PRINTER: ''') ;
        WRITELN(SPACE:10,'< 3 > ''CONSOLE: ''') ;
        WRITELN(SPACE:10,'< 4 > ''FILE     ''') ;
        WRITELN ;
        WRITE(SPACE:15,'YOUR CHOICE? ') ;
        READLN(CHOICE) ;
        CASE CHOICE OF
           1:REWRITE(OUT_PUT,'REMOUT:')  ;
           2:REWRITE(OUT_PUT,'PRINTER:') ;
           3:REWRITE(OUT_PUT,'CONSOLE:') ;
           4:REWRITE(OUT_PUT,'*BLOCK.TEXT[*]')
         END ;
      UNTIL (CHOICE IN [1..4])AND(IORESULT=0)
    END ;

    PROCEDURE ASCII_WRT ;
    BEGIN
      WRITE(OUT_PUT,' ') ;
      FOR COUNT2:=COUNT1-(FORMAT-1) TO COUNT1 DO
        IF (BUFFER[COUNT2]>=0)AND(BUFFER[COUNT2]<32)OR
```

```
          (BUFFER[COUNT2]>126) THEN
          WRITE(OUT_PUT,'.')
            ELSE
          WRITE(OUT_PUT,CHR(BUFFER[COUNT2])) ;
      WRITELN(OUT_PUT) ;
      IF COUNT1<>512 THEN
        WRITE(OUT_PUT,COUNT1:3,':')
    END ;

BEGIN   (* OF MAIN *)
  1111:
  HEX_ARRAY:='0123456789ABCDEF' ;
  SETUP ;
  WRITELN(OUT_PUT,'BLOCK # ',BLOCK:3) ;
  WRITELN(OUT_PUT) ;
  UNITREAD(IN_UNIT,BUFFER[1],512,BLOCK) ;
  FOR COUNT1:=1 TO 512 DO
  BEGIN
    IF COUNT1=1 THEN
      WRITE(OUT_PUT,COUNT1-1:3,':') ;
    CHR_BYTE[0]:=HEX_ARRAY[(BUFFER[COUNT1] DIV 16)] ;
    CHR_BYTE[1]:=HEX_ARRAY[(BUFFER[COUNT1] MOD 16)] ;
    WRITE(OUT_PUT,CHR_BYTE:3) ;
    IF ((COUNT1 MOD FORMAT=0)AND(COUNT1<>1))OR(COUNT1=512) THEN
      ASCII_WRT
  END ;
  CLOSE(OUT_PUT,LOCK) ;
  WRITELN ;
  WRITELN('ENTER < Q > TO QUIT') ;
  WRITE('OTHER <ANY> TO CONTINUE ') ;
  READLN(CONTROLTEST) ;
  IF CONTROLTEST<>'Q' THEN
    GOTO 1111
      ELSE
    EXIT(EXAMINE)
  (*$R+,I+*)
END.    (* OF MAIN *)
```

```
BLOCK 2
  0: 00 00 06 00 00 00 06 41 50 50 4C 45 33 00 18 01 .......APPLE3...
 16: 20 00 00 00 E8 A0 00 00 00 00 06 00 26 00 05 00  ...........&...
 32: 0C 53 59 53 54 45 4D 2E 41 50 50 4C 45 00 24 67 .SYSTEM.APPLE.$g
 48: 00 02 9B A0 26 00 2A 00 02 00 0E 46 4F 52 4D 41 ....&.*....FORMA
 64: 54 54 45 52 2E 43 4F 44 45 67 00 02 E8 A0 2A 00 TTER.CODEg....*.
 80: 30 00 05 00 0E 46 4F 52 4D 41 54 54 45 52 2E 44 0....FORMATTER.D
 96: 41 54 41 67 00 02 E8 A0 30 00 38 00 02 00 0C 4C ATAg....0.8....L
112: 49 42 52 41 52 59 2E 43 4F 44 45 00 24 67 00 02 IBRARY.CODE.$g..
128: F9 A0 38 00 41 00 02 00 0B 4C 49 42 4D 41 50 2E ..8.A....LIBMAP.
144: 43 4F 44 45 00 00 24 67 00 02 18 A0 41 00 62 00 CODE..$g....A.b.
160: 02 00 0A 53 45 54 55 50 2E 43 4F 44 45 3D 00 00 ...SETUP.CODE=..
176: 24 67 00 02 72 9E 62 00 67 00 02 00 0B 42 49 4E $g..r.b.g....BIN
192: 44 45 52 2E 43 4F 44 45 00 00 24 67 00 02 18 A0 DER.CODE..$g....
208: 67 00 6F 00 02 00 09 43 41 4C 43 2E 43 4F 44 45 g.o....CALC.CODE
224: 72 3D 00 00 24 67 00 02 CC 9D 6F 00 73 00 03 00 r=..$g....o.s...
240: 0D 4C 49 4E 45 46 45 45 44 2E 54 45 58 54 24 67 .LINEFEED.TEXT$g
256: 00 02 18 A0 73 00 75 00 02 00 0D 4C 49 4E 45 46 ....s.u....LINEF
272: 45 45 44 2E 43 4F 44 45 24 67 00 02 18 A0 75 00 EED.CODE$g....u.
288: 79 00 03 00 0E 53 4F 52 4F 43 47 4F 54 4F 2E 54 y....SOROCGOTO.T
304: 45 58 54 67 00 02 D3 9F 79 00 7B 00 02 00 0E 53 EXTg....y.{....S
320: 4F 52 4F 43 47 4F 54 4F 2E 43 4F 44 45 67 00 02 OROCGOTO.CODEg..
336: E8 A0 7B 00 7C 00 05 00 0E 53 4F 52 4F 43 2E 4D ..{.|....SOROC.M
352: 49 53 43 49 4E 46 4F 67 C0 00 D3 9E 7C 00 80 00 ISCINFOg....|...
368: 03 00 0E 48 41 5A 45 4C 47 4F 54 4F 2E 54 45 58 ...HAZELGOTO.TEX
384: 54 67 00 02 D3 9F 80 00 82 00 02 00 0E 48 41 5A Tg.........HAZ
400: 45 4C 47 4F 54 4F 2E 43 4F 44 45 67 00 02 E8 A0 ELGOTO.CODEg....
416: 82 00 83 00 05 00 0E 48 41 5A 45 4C 2E 4D 49 53 .......HAZEL.MIS
432: 43 49 4E 46 4F 67 C0 00 33 9F 83 00 8B 00 03 00 CINFOg..3.......
448: 0D 43 52 4F 53 53 52 45 46 2E 54 45 58 54 24 67 .CROSSREF.TEXT$g
464: 00 02 43 A0 8B 00 8E 00 02 00 0D 43 52 4F 53 53 ..C........CROSS
480: 52 45 46 2E 43 4F 44 45 24 67 00 02 18 A0 8E 00 REF.CODE$g......
496: 94 00 03 00 0E 53 50 49 52 4F 44 45 4D 4F 2E 54 .....SPIRODEMO.T
```


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R.G. Stevenson

IN THE continuing saga of System 80 incompatibility with TRS programs, the following comes from John Ross, System 80 section leader in the Adelaide Users' Group.

It seems there's a major and possibly insurmountable obstacle for some System 80s attempting to record the assembled (object) code from EDTASM+. As reported earlier, some have a hardware deficiency which is relatively easily fixed. Some have no problems at all and so may dismiss this as mere waffle and rejoice in their good fortune. Some can be fixed by changing the program thus:

Disk version	Tape version	Contents	Change to
638C	5341	0642	0608
639C	5351	0680	0641
63A3	5358	0622	0676

Others seem to defy all remedy. Our only suggestion is unprintable!

Changes necessary because TRS programs assume the printer will be at 37E8, and System 80 has it at port FD, are rather easier (thankfully!). Simply change references to 37E8 to port FD. Usually there are two varieties; checking printer status, and sending data out — so 32 E8 37 (LD (37E8),A) becomes D3 FD (OUT portFD,A) and 3A E8 37 (LD A,(37E8)) becomes DB FD(IN A,portFD). Mon-3 is an ideal utility to search for these bytes — the command W makes it quite painless. As an example, changes to TRCOPY:

Address	Contents	Change to
48CA	3A	00
48CB	E8	B
48CC	37	FD
48D4	32	00
48D6	37	D3
48D6	37	FD

Similar changes are easily made to EDTASM, Scripsit, Electric Pencil, and indeed any program that uses 37E8 as the printer address (which it is...).

As for the hardware changes necessary to avoid having to change sound programs: a simple switch will divert sound out the auxiliary recorder lead, as well as enabling loading System tapes through it.

Those with the earlier models without the arrow and clear keys will find them relatively easy to fit. Alan Jeffries (c/- the Adelaide Users' Group) does it professionally as part of his television service business; if logistics of transport make it impractical he also offers advice, although if you need detailed advice there may be some reason to think again about getting inside your machine with hot soldering iron.

The Random Generator

In the column where I was delving into such things there was not space for a program to generate X-Lotto numbers, so I present it here:

```
0 'X-LOTTO NUMBER GENERATOR
10 DIMA(40)
20 FORI=1TO8
30       FORJ=1TO40:A(J)=0:NEXTJ
40       FORJ=1TO6
50               X=RND(40)
60               IFA(X)<>0THENGOTO50
70               A(X)=X
80               PRINTUSING"#####";X;
90       NEXTJ
100      PRINT
110 NEXTI
```

I don't pretend any 'fanciness' in this program. It does the job, and that's all! As I said in June, it won't win for you, and probably won't do as well as you could by picking the numbers yourself.

Also, as I said in an earlier column, there's probably something to be gained by looking at any listing, in this case lines 30 and 70 to find out how I've checked to see that the same number is not generated twice within the same game.

The next obvious attraction that presents itself is to check the 'randomness' of the RND function. So I present the bare bones of a routine to do just that:

```
0 'RANDOM NUMBER FREQUENCY COUNTER
10 CLS
20 INPUT"HOW MANY TIMES";N
30 CLS
40 FORI=1TO10:A(I)=0:NEXTI
50 FORI=1TON
60      X=RND(10)
70      A(X)=A(X)+1
80 NEXTI
90 PRINT"IN A TOTAL OF"N;"GENERATIONS:"
100 PRINT
110 FORI=1TO10
120     PRINTUSING"## WAS GENERATED ### TIMES"
        ;I;A(I)
130 NEXTI
140 PRINT:PRINT:PRINT:GOTO20
```

Again the simplicity is evident. In particular there is enormous scope for improving the output display. Perhaps a bargraph? Perhaps a plotted curve showing the distribution? Any graphical display will better the present output. So it's over to you, reader (*Hopefully you mean* readers, *Rod* —**Ed**).

Assembly-Fiddlers

Having alluded to my liking for assembly in past columns, it seemed time I revealed my particular mind-workings. This is of not a lot of real use, except in the enjoyment of writing it. See what you think?

```
;ROUTINE TO DISPLAY CONTENTS OF A MEMORY LOCATION
;IN HEX ON THE SCREEN.
;
;USES FIRST SCREEN ADDRESS AS MEMORY LOCATION FOR CONVENIENCE.
;
START   EQU     7FD0H           ;CONVENIENT LOCATION
        ORG     4016H           ;INTERCEPT KEYBD SCAN
        DEFW    START
        ORG     START           ;ACTUAL ROUTINE
;
;GET LEFT-HAND CHARACTER
MSN     LD      A,(3C00H)       ;GET DATA FIRST SCREEN ADDRESS
        CP      20H             ;TO COMPENSATE FOR HARDWARE
        JR      NC,OK           ;PROBLEM WITH A L/C CHARACTER-
        ADD     A,40H           ;GENERATOR WITH 3-ROM SET
OK      SRL     A               ;SHIFT MSN TO APPEAR AS LSN
        SRL     A
        SRL     A
        SRL     A
        LD      HL,3C30H        ;SCREEN ADDRESS TO DISPLAY MSN
        CALL    ASCII           ;CONVERT & DISPLAY
;
;GET RIGHT-HAND CHARACTER
LSN     LD      A,(3C00H)       ;GET DATA FIRST SCREEN ADDRESS
        AND     0FH             ;MASK IT TO USE ONLY MSN
        LD      HL,3C31H        ;SCREEN ADDRESS TO DISPLAY LSN
        CALL    ASCII           ;CONVERT & DISPLAY
;
;ORIGINAL KEYBD SCAN MUST BE REPLACED OR SYSTEM WILL CRASH!!
KEYBO   CALL    3E3H            ;REPLACE ORIGINAL KEYBD SCAN
        RET                     ;CONTINUE WITH OPERATING SYSTEM
;
;SCREEN REQUIRES DATA AS ASCII
ASCII   ADD     A,3DH           ;CONVERT TO ASCII
        CP      3AH             ;CHECK IF NUMERIC
        JR      C,DSPLY         ;IF SO, DISPLAY IT
        ADD     A,7H            ;IF NOT, MAKE IT ALPHABETIC
DSPLY   LD      (HL),A          ;DISPLAY ON SCREEN
        RET                     ;BACK TO WHERE CALLED FROM
        END
```

As this is not intended as a 'tutorial', I'll limit explanations to a few pertinent points (anyway, the remarks ought to reveal all).

The reason for putting it into 4016H by line 170 is that I like playing with the operating system. What this will do is force operation of this whole routine every time the keyboard is scanned, with the result that the display will be constantly updating. The reason for using the first screen location in lines 210 and 330 is to allow for easy changing by simply putting a character there. Much easier to appreciate once seen than to explain.

It is intended that this be typed in with EDTASM: although it is possible to POKE it, there are traps laying in wait for the unwary so doing. I won't explain more here, as Our Esteemed Editor Les is covering elementary assembly elsewhere — but, of course, if there's a demand...

Indeed the method of input allows great scope for 'fiddling' here too. So with the two BASIC programs and this assembly one all allowing for vast improvements there will surely be enough to keep all fiddling happily till next month.

your computer club news

ACT

Australian ZX80/81 Users Association (AZUA); David Brudenall, 19 Godfrey St, Campbell 2601.

MICSIG; Secretary, PO Box E237, Canberra 2601.

OMEGA (Ohio Scientific Microcomputer Enthusiasts Group Australia); Geoff Cohen, 72 Spofforth St, Holt 2615.

Sorcerer Computer Users of Australia (ACT Branch); Mr G T Dick, 31 Creswell St, Campbell 2601.

Apple User Group (ACT); Jeff Brock, 1 Buckley Circuit, Kambah 2902. Phone (062) 31 3630.

ACT Micro 80 Users Group; Bill Cushing, 10 Urambi Village, Kambah 2920. Phone 062) 31 3699.

Canberra Compucolor Club (CCC); Meets 7.30 on the first Sunday of every month at the offices of Digital Equipment, 28 Lonsdale Street, Braddon ACT.

NSW

Apple Users Group (Sydney); PO Box 505, Bankstown 2200. Phone Colin Rutherford, (02) 520 0926.

Atari Computer Enthusiasts (NSW); 78 Ayres Road, St Ives 2075. Phone enquiries: Garry Francis (2 0933 ext. 354 or 789 1397) or Paul Phillips (449 6286 ah).

Australasian ZX80 Users Newsletter; 87 Murphys Avenue, Keiraville 2500.

Commodore Users Group; John Guidice, GPO Box 4721, Sydney 2001.

Compucolor Users Group; David Brown, 91 Regent St, Chippendale, 2008.

80-AT, The Australian 8080-Z80 Users Group; PO Box 165, Lakemba 2195.

Macarthur Computer Users Association; R G Friend, C/- 109 Campbellfield Ave, Campbelltown 2560. Phone (046) 25 2752 (ah) or (046) 76 0541 extn 325 (work).

MEGS, (Microcomputer Enthusiasts Group); John Whitlock. PO Box 3, St Leonards 2065.

Newcastle Microcomputer Club; Gordon Johnson, Electron Microscope Unit, University of Newcastle. Phone (049) 68 5045 (work).

NSW 6800 User Group; 27 Georgina Ave, Keiraville 2500.

Sorcerer Users Group; PO Box E162, St James 2001. Ian King, 15 Forest Ave, Wahroonga 2076. Phone (02) 48 6072.

Illawarra Super 80 Users Group; Jim O'Grady, Chairman, PO Box 1775, Wollongong 2500.

TI-99/4 Home Computer Users Group of Sydney; S Anderson, PO Box 101, Kings Cross 2011. Phone (02) 358 6662.

Blue Mountains Computer Club; Eric Lindsay, (047) 51 1044; or T Macindoe, C/- PO Faulconbridge 2776.

Sorcerer Computer Users of Australia (NSW Branch); C/- PO Box 461, Ashfield 2131. Phone Howard Lardner (02) 357 6783 (ah).

Mi Computer Club; Polk House, 55 Herbert St, Artarmon 2064. Phone (02)439 6355.

Northern NSW MiCC Chapter; Alan Hartley, Dundurrabin via Dorrigo 2433. Phone (066) 57 8160.

QUEENSLAND

Brisbane Youth Computer Group; A Harrison, PO Box 396, Sunnybank 4109.

Commodore Computer Users Group of Queensland; Mrs D D Dillan, PO Box 127, Stones Corner 4120.

IREE Microcomputer Interest Group; N Wilson, PO Box 811, Albion 4010.

Superboard Users Group; Ed Richardson, 146 York St, Nundah 4012.

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Adelaide Micro User Group, (TRS-80 and System 80 Users); R G Stevenson, 36 Sturt St, Adelaide 5000.

South Australian Apple Users Club; The Secretary, SAAUC, C/- The Bookshelf, 169 Pirie St, Adelaide 5000.

South Australian Microprocessor Group Inc, (SAMG); The Secretary, PO Box 113, Plymton 5038. Phone (08) 278 7288

Compucolor-Intecolor User of South Australia; PO Box 86, Torrensville 5031. Phone (08) 352 3296

South Australian Sorcerer Users Group; Trevor Bird. Phone (08) 266 1305.

Sorcerer Users Group of South Australia; Jeremy Webber, 22 Delange Ave, Banksia Park 5019.

VICTORIA

Apple Users Society of Melbourne; G Halprin. Phone (03) 859 5835.

BUG 80, (Burwood Users Group); PO Box 46, Blackburn South 3130.

Compucolor Users Group; L Ferguson, 12 Morphett Ave, Ascot 3342.

Geelong Computer Club; Peter McKeon, PO Box 93, Geelong 3220.

KAOS, (Ohio Scientific); David Anear, 49 Millewa Cres, Dallas 3047.

National ZX80 Users Club; 24 Peel St, Collingwood 3066.

Northern and Western Suburbs Computer Users Group; contact CP/M Data Systems, 284 Union Rd, Moonee Ponds 3039. Phone John King (Secretary) (03) 338 9304.

SMUG, SCORD M100 Users; Robin Miller, 60 Winmalee Drv, Glen Waverley 3150.

Sorcerer Computer Users (Australia); Secretary, PO Box 144, Doncaster 3108.

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National Sinclair Users Group; PO Box 148, Glen Waverley 3150.

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Perth 80 Users Group, System 80 and TRS-80 Users; C Powell. Phone (09) 457 6849.

The Western Australia Atari Computer Club; Mr Alf Gaebler, Secretary, PO Box 7169, Cloisters Square, Perth 6000.

NORTHERN TERRITORY

The Microcomputer Association of the Northern Territory; Andy Smith, Darwin Community College, Casuarina 5792.

Northern Territory 80 Computer User Group; R T O'Brien, 433 McMillans Rd, Jingili, Darwin 5792.

TASMANIA

TAS-Micro; Peter Deckert, Unit 1/456 West Tamar Rd, Riverside, Launceston 7250.

Tasmanian OSI User Group; David Tasker, 111 Bass Highway, Westbury 7303.

NEW ZEALAND

Wellington Microcomputer Society Inc; Lindsay Williams, 2 Pope St, Plimmerton, New Zealand.

A RECENTLY formed group known as the Canberra Compucolor Club (CCC) caters for users of Compucolor and Intecolor computers. Meetings are held at 7.30 on the first Sunday of every month at the offices of Digital Equipment, 28 Lonsdale Street, Braddon ACT. Newcomers are welcome to come to the meetings or contact either Jim Farquhar (phone 41 2870 ah) or Ken Kerrison (65 5417 or 73 3793 ah). Membership is $10 per year.

The ACT Apple Users Group meets on the second Thursday of each month. For more information, write to Jeff Brock, PO Box 1231, Canberra City, 2601. Phone (062) 31 3630.

DUE TO the interest in the Applied Technology DGOS Z80, the A.T. Micro Computer Club has been started. Numerous programs have been converted into Microworld BASIC, with several more still in the pipeline. The first official meeting has yet to be set, so could all interested parties contact Grant Forest on: (03) 879 2257 (home), or (03) 699 2888 (work), to help get the club off the ground!

APF IMAGINATION Machine users interested in forming a Users' Group for the exchange of information, programs, and so on should contact Norm McMahon of 288 Kissing Point Road, North Turramurra 2074. Phone: (02) 44 2645 (after 7.30 pm.).

A NEW users group has been formed for Atari computer owners. The group was formed by a steering committee of three people in January with the aims of promoting the Atari 400/]•• home computer system: instructing both beginners and advanced users in programming techniques and exchanging hints, tips and ideas amongst members.

Meetings are held at 6 pm on the first Monday of every month (or the second Monday if it clashes with a public holiday) at the offices of: I.P. Sharp Associates, 8th Floor, Carlton Centre, 55 Elizabeth Street, Sydney (between King Street and Martin Place).

Meetings are not restricted to Atari owners.

Subscriptions ($15) or postal enquiries may be directed to: Atari Computer Enthusiasts (N.S.W.), 78 Ayres Road, St Ives 2075. Phone enquiries: Garry Francis (2 0933 ext. 354 or 789 1397) or Paul Phillips (449 6286 ah).

your ATARI computer

By Paul Phillips

THIS month I want to talk about the Atari character set, and how you can modify it.

All microcomputers have a character set. It is simply a table containing the shape of each character the computer can display. The Atari allows you to modify its character set so any character can be displayed.

For example, you could underline all the upper-case alphabetic characters or completely redesign them, and so on. You could change some of the Atari's special graphics characters to electronic symbols, making possible the display of circuit diagrams.

For the display of characters the Atari divides the television screen into blocks of points. Each block is eight points wide by eight points high in Graphics mode 0. Since the screen consists of 320 by 192 such points, it is possible to display 40 by 24 characters in Graphics mode 0.

In order to display a character, the appropriate points on the screen in the block where the character is to be displayed are 'turned on' by the computer. For example, the character 'X'is displayed as in figure 1 where a 1 represents a point that is on, and a 0 represents one that is off.

```
0 0 0 0 0 0 0 0   Row 1, Byte 1
0 1 1 0 0 1 1 0   Row 2, Byte 2
0 1 1 0 0 1 1 0   Row 3, Byte 3
0 0 1 1 1 1 0 0   Row 4, Byte 4
0 0 1 1 1 1 0 0   Row 5, Byte 5
0 1 1 0 0 1 1 0   Row 6, Byte 6
0 1 1 0 0 1 1 0   Row 7, Byte 7
0 0 0 0 0 0 0 0   Row 8, Byte 8
```

Notice there are no points 'turned on' on the edges of the block. This is how the Atari allows for spaces between characters. In a modified character set you could, for example, use points on the edges to produce continuous script text.

Now, in order to display each character correctly, The Atari has in its memory a table of data called its character set. Each character the Atari can display is represented by a string of eight bytes of data in the character set. Each of the bytes for a particular character corresponds to one of the rows of points in the display of that character.

In the example in figure 1, each of the rows of ones and zeros corresponds to one byte of data in the character set. By taking each row as a binary number and converting it to hexadecimal, we get the 8 bytes that represent the letter 'X' in the character set. They are 00 66 66 3C 3C 66 66 00, while the decimal equivalents are 0 102 102 60 60 102 102 0.

Each character the Atari can display is similarly represented by eight bytes and, as it can display 128 different characters, the total storage required for the character set is 1024 bytes, or one Kbyte.

When displaying a character, the Atari 'looks up' the bytes for that character set, in order to generate the appropriate 'turned on' points on the television screen.

The starting address of the character set in memory is stored in a location called CHBAS. CHBAS has the decimal address 756 (hex 2F4). This starting address is stored as a page number.

A page is 256 bytes of memory, so page 0 is the first 256 bytes of memory, page 1 is the next 256, and so on.

Thus the starting address of the character set is obtained by multiplying the page number found at CHBAS by 256. If you POKE CHBAS with 1, you will see the screen display garbage. This is because the computer now thinks that its character set starts at page 1, and is using whatever data it finds on pages 1 to 4 as its character set data. System reset will restore the original character set.

Each character in the set has a special code number known as the 'internal character set number'. This is a number from 0 to 127 that indicates the character's position in the set. A list of the internal character numbers can be found on page 55 of the BASIC reference manual. Since each character is represented by eight bytes, a given character will start at the address given by:

(256*CHBAS)+(8*internal character set number of the character)

We now have all the information necessary to produce a modified character set.

Because the Atari's default character set is stored in ROM (Read Only Memory), it cannot be modified as it is. It must first be copied into the computer's RAM (Random Access Memory).

We can then tell the computer that its character set is in RAM by POKEing a new address into CHBAS. This 'new' character set in RAM may be modified by POKEing new data into the bytes corresponding to the characters being modified.

In order to copy the character set, it is necessary to set aside some memory so the computer will not mess up the new character set by writing data over it.

We can reserve memory by telling the Atari it has a smaller amount of memory than it actually has (*gullible things, these computers* - **Ed**).

Location 106 (decimal) contains the last page number of your memory. For example, in a 16K system, location 106 will contain the decimal number 64, indicating that there are 64 pages of RAM available to the computer.

To reserve four pages of memory (which is the 1024 bytes required for the character set), simply POKE location 106 with a number four less than the number that is currently there. It will then be necessary to give a Graphics 0 command, because the Atari's video system uses the top of memory, and it must be reset to where the Atari now thinks the end of its memory is.

Program one will copy the character set as described, and will use the new character set.

```
5  REM PROGRAM 1 COPY CHARACTER SET
10 RAMTOP=PEEK(106)-4
20 CHBAS=PEEK(756)
30 POKE 106,RAMTOP
35 GRAPHICS 0
40 CHSTART=CHBAS*256
50 CHSTARTNEW=RAMTOP*256
60 FOR I=0 TO 1023
70 POKE CHSTARTNEW+I,PEEK(CHSTART+I)
80 NEXT I
90 POKE 756,RAMTOP
```

Now, to modify a character, find its internal character set number and multiply this by eight. Add this to the starting address of your new character set, to find the starting address of the character. Changing the byte at the address so generated or at any of the following seven bytes will modify the character.

Program two copies a new character set, and then allows you to modify any of the upper-case alphabetic characters. The program will prompt you for eight new bytes for the characters being modified.

Enter eight numbers less than 256 one at a time (that is, press RETURN after each number). System Reset will restore the default character set.

```
5   REM PROGRAM 2 MODIFY CHARACTERS
6   DIM CH$(26),X$(1)
7   REM COPY CHARACTER SET
10  RAMTOP=PEEK(106)-4
20  CHBAS=PEEK(756)
```

```
30  POKE 106,RAMTOP
35  GRAPHICS 0
40  CHSTART=CHBAS*256
50  CHSTARTNEW=RAMTOP*256
60  FOR I=0 TO 1023
70  POKE CHSTARTNEW+I,PEEK(CHSTART+I)
80  NEXT I
90  POKE 756,RAMTOP
100 READ CH$
110 PRINT "ENTER CHARACTER (* TO STOP)"
120 PRINT
130 INPUT X$
140 IF X$(1,1)="*" then 900
150 X=32
160 FOR I=1 to 26
170 X=X+1
180 IF X$(1,1)=CH$(I,I) THEN 200
190 NEXT I
195 GOTO 110
200 PRINT "ENTER 8 NEW BYTES"
210 FOR I=0 TO 7
215 TRAP 950
220 INPUT CH
230 POKE CHSTARTNEW+8*X+I,CH
240 NEXT I
250 GOTO 110
800 DATA ABCDEFGHIJKLMNOPQRSTUVWXYZ
900 END
950 PRINT "ERROR, TRY AGAIN" : GOTO 215
```

There are many application for modified character sets; I have already mentioned a few.

An example of the sort of thing that can be done is the Atari 'Space Invaders' program. In this program, the Invaders are modified characters printed in Graphics mode 2. The writer of the program used several modified character sets, each one containing the Invaders in a slightly different position.

The Invaders are animated by the program switching between character sets. (This is done by POKEing different values into CHBAS.) This is just one example of the sorts of things that can be done with the Atari character set.

Atari Users Group

The first meeting of the Sydney Atari Users Group was held on Monday March 1. It was a great success, with about 25 people turning up. Every one was keen to learn more about their machine.

It was decided that future meetings will be held on the first working Monday of each month at 6pm. For details, either contact your local Atari stockist, or phone Paul Phillips on 449-6286. □

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YC 13

your ZX81 computer

By David Brudenall

THE NEWS of the Sinclair Spectrum, Sinclair's Apple look-alike, can only spark a chill of dread in the hearts of all ZX81 owners. We saw the ZX80 sink into the depths of obscurity almost as soon as the ZX81 was released, and now it looks like Clive Sinclair is repeating his earlier performance.

As soon as the Spectrum becomes available it is almost certain that current ZX81 software suppliers will begin focusing on the new machine, even though the sales of the ZX81 have easily exceeded 250,000. If the Spectrum is a success no doubt sales of the Spectrum's obvious competitor, the VIC, will decrease.

The Spectrum is offering good value for money with the basic 16K RAM configuration; and of course now there is the advantage of disk drives, which would have been nice had they ever been available for the ZX80/]fi. In fact Sinclair had been 'promising' disk drives for the Sinclairs ever since the ZX80 was released...

Getting back to the ZX81 for a minute, it is heartening to find that some quality ZX81 software is at last being introduced in Australia.

If you own a ZX81 and would like some of the arcade-type high speed whizz-bang machine code games that seem to be available in abundance for the Apples, TRS-80s and Pets; up until now you would have twiddled your thumbs while glowering jealously at the Apples and Tandys — thankfully no longer!

Machine-code games are available from such sources as Melbourne House Publishing (who have been supporting the Sinclairs since *30 Programs for the Sinclair ZX80 — 1K*, about the first book ever for the ZX80), and another, less likely source; Ken Johnstone, a member of AZUA.

Ken was just another ZX80 owner, frustrated by the lack of high-quality games for the '81, but he wrote away to UK firms about software they were offering. The result was that Ken began selling this software in Australia, with an arrangement with the authors to pay them royalties.

I have seen two examples of the ZX81 software Ken is selling: a Space Invaders game which is a surprisingly good adaptation of the arcade game (the only real difference being the presence of a 'shield' button to protect your laser base); the other game being an Othello game which, with two skill levels, provides a challenge both to experienced and novice players alike.

Hopefully you will see more thorough reviews of these programs (and others, Ken?) in the coming months.

Finally, there is one rather prolific ZX author residing in Melbourne, producing quite a lot of stuff; not all of it games. He has produced a games cassette, a strategic space war style game somewhat reminiscent of Star Trek, but with its own bells and whistles, and of course the Adventure in Time program reviewed in *Your Computer* April.

The latest addition to his catalogue was his Create-a-game program. Yes, it is none other than Geoff Gloster, alias Gloster Software; one of the few software firms that nearly all Australian ZX81 and 8K ROM ZX80 owners have at least heard of.

If you sell arcade type games (or any games?) for the ZX81 or 8K ROM ZX80 and I haven't mentioned you, please contact me via AZUA, in the club pages, so I

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can rectify the situation.

Please note you can contact Melbourne House in Melbourne (funny that) at Suite 4, 75 Palmerston Crescent, South Melbourne, 3205; Ken Johnstone (K.J. Software) at 8 Cawrse Street, Elizabeth Field, S.A. 5113; and Gloster Software at GPO Box 5460cc, Melbourne 3001.

Next column will have a list of suppliers that offer hardware add-ons for the ZX81. I'll try to include as many suppliers as I can find but I'll probably miss out on the odd one or two.

The add-ons include high resolution boards, additional memory, keyboards, joysticks, sound boards, and character generators. Obviously most (if not all) of these suppliers will be UK companies, so you'll have to consider the cost of shipping, sales tax and import duty above the cost of the item.

A rough estimate of the price you'll end up paying in $A can be achieved by simply doubling the stated price (that's for UK items).

This Month's Program

Actually, this short routine isn't really a program, it is just an example of a method to replace those three functions that are normally considered mandatory on 'larger' machines.

Of course I'm talking about DATA, READ and RESTORE. Instead of data being held in DATA statements they can be held in strings. Up to 26 such data strings can be held, from A$ to Z$; alternatively, the data sets can all be held in separate A$ strings, and the machine reads them one at a time by GOSUBing and RETURNing.

As you can see in the example both numerical and character data can be held in the strings, although to make proper use of numbers VAL would be needed to convert the digits in the string to real numbers. Care must be taken to ensure that the machine doesn't try to VAL a word! In the example below, to RESTORE the data, all that has to be done is to RUN the program again.

Finally, here is a message to all ZX80 and ZX81 owners who aren't members of AZUA (the Australian ZX80/81 Users' Association): send away to the address in the club pages for a free Introductory Newsletter. Don't forget your name, address and a 40 cent stamp (the newsletter is free, but the postage isn't).

```
  1 REM DATA FOR THE ZX81
 10 LET B$=""
 15 REM PUT DATA IN A$
 20 LET A$="SINCLAIR,ZX81,200,1
000000,YOUR COMPUTER,MI COMPUTER
"
 25 REM CHECKS TO SEE IF A COMM
A HAS BEEN FOUND OR THE END OF D
ATA HAS BEEN REACHED
 30 IF CODE A$=26 OR A$="" THEN
 GOTO 80
 40 REM ADDS DATA TO B$ AND SUB
TRACTS DATA FROM A$.
 50 LET B$=B$+A$(1 TO 1)
 60 LET A$=A$(2 TO )
 70 GOTO 30
 80 REM REMOVES THE COMMA, IF T
HERE IS ONE
 83 IF CODE B$=26 THEN LET B$=B
$(2 TO )
 87 REM CHECKS TO SEE IF DATA I
N B$ IS NUMERICAL
 90 IF CODE B$<27 OR CODE B$>37
 THEN GOTO 120
 95 REM DATA IS NUMERICAL SO VA
L IS EXECUTED
 100 LET N=VAL B$
 105 REM CLEARS B$
 110 LET B$=""
 120 PRINT "THE DATA ITEM IS ",
 130 REM CHECKS TO SEE IF THE DA
TA ITEM IS NUMERICAL OR NOT
 140 IF B$<>"" THEN PRINT B$
 150 IF B$="" THEN PRINT N
 160 REM CHECKS TO SEE IF END OF
 DATA HAS BEEN REACHED
 170 IF A$="" THEN GOTO 240
 180 REM PAUSES DISPLAY AND CLEA
RS SCREEN
 190 PAUSE 70
 200 POKE 16437,255
 210 CLS
 215 REM CLEARS B$ AND RETURNS T
O GET NEXT DATA ITEM
 220 LET B$=""
 230 GOTO 40
 240 PRINT
 250 PRINT "THATS THE END OF THE
 DATA"
 260 STOP
```


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your computer glossary

Absolute: Located at a fixed address in memory.

Access: To read or write from a location in memory, or a file, or disk.

Accumulator: The major register of a CPU, in which arithmetic and logical functions are performed. Some computers have several registers which can function as accumulators; in others some registers can perform a subset of the full set of operations.

Address: A memory location which can contain data or an instruction.

Algol: Algorithmic Language, an early computer programming language for mathematical applications. Widely used in Europe, embodied early structured programming concepts and was a precursor of Pascal.

Algorithm: A set of instructions which define a method of obtaining some result (usually mathematical). A cooking recipe is an algorithm, as is a knitting pattern.

Alphanumeric: Composed of either letters or numbers or both.

Analogue (Analog): Representation of a value by a voltage or some other measureable datum, rather than a binary or other representation based on counting.

Apple: The Apple 11 computer is a computer based on the 6502 microprocessor with an integrated keyboard. Noted for its colour graphics capabilities, which make it popular with schools.

Application: What you do with your computer.

Array: A set of values under a common variable name, which are accessed through a subscript. For example A[1] is the first item in array A, A[2] is the second, etc. A[N] is the Nth item.

ASM: Assembler. also a suffix added to assembly language file names to distinguish them from other files with the same name.

Assembler: A program which converts assembly language into its corresponding machine (or object) code, which can be executed by the computer.

Assembly Language: A language in which each machine code instruction is represented by a short mnemonic which is much more comprehensible to the programmer. For example, the 8080 machine code

[10010110]

in binary, is

[SUB L]

(subtract L from accumulator) in assembly language. Each line of assembly language becomes one machine instruction.

Assign: To make one thing equal to another, e.g: [A = B] assigns the value of B to A.

Atom: An indivisible component of a data structure.

Attribute: A property possessed by some object, such as a file.Often attributes take the form of restrictions, such as a file being read-only.

Backup: An extra copy of a disk, tape or file taken as a precaution against damage of the original.

Backus Normal form: A special language (a metalanguage) used to describe precisely the grammatical rules of another language.

Base: The lowest number inexpressible in a given number system.

BASIC: Beginners All-purpose Symbolic Instruction Code. Invented in 1970 at Dartmouth College By Kemeny and Kurtz as a teaching language, it has since been enhanced in its more exotic forms into one of the most sophisticated yet easy-to-use languages available on personal computers. Its major rival is Pascal, which has the added virtue of stressing structured program design.

BDOS: Basic Disk Operating System. The major functional component of the CP/M DOS.

Binary: The system of counting in 1s and 0s used by all digital computers.

Binary Search: A method of searching for an entry in a table by successively halving the table until all that's left is the desired entry.

Binary Tree: A form of data structure in which entries are tagged on at the end of the appropriate branches.

BIOS: Basic Input/Output System. The part of the CP/M operating system which is different for each machine and provides any special I/O routines for disks, terminal, printer, etc.

Bit: Binary Digit. Either 1 or 0.

Boot: To load the operating system into the computer from a disk or tape, either initially or subsequently after running a program.

Bootstrap: To use one short program to load a longer loader program which then loads the operating system.

Branch Instruction: A program instruction which causes the computer to jump to another instruction, usually fairly close by.

Buffer: An area of memory used for temporary storage while transferring data to or from a peripheral such as a printer or a disk drive.

Bug: an error in a program. Makes programmers itch.

Bus: A set of wires over which, data, addresses, or control signals are transferred between the central processor and memory or I/O devices.

Byte: A computer word eight bits wide. A byte in memory can hold a character or a binary number between zero and 255 (or — 128 and 127), or a computer instruction.

C: A programming language, developed at Bell Labs, which is particularly convenient for writing system utility programs.

Case Statement: An instruction found in some high level languages which allows control to pass to one of several subroutines depending on the value of a variable. For example, the BASIC statement

ON X GOSUB 100, 200, 300

will jump to line 100 if X = 1, 200 if X = 2, 300 if X = 3.

Call: A jump to a subroutine which leaves the return address on the microprocessor stack, so that when the subroutine is finished executing, control returns to where it left off.

CBASIC: A commercial version of the BASIC language, running under the CP/M operating system. Doesn't use line numbers on every line, and is compiled, rather than interpreted like Microsoft BASIC.

CCP: Console Command Processor. The part of the CP/M operating system that reads a command line and sorts out what it means.

Chain: To automatically run one program after another.

Character: A letter or number, or in some circumstances, a control code such as "carriage return".

Checksum: A running total of the characters in a file, recorded or transmitted with the file so that errors can be detected.

Code:

Absolute: Machine instructions which are intended to be loaded and executed in a particular area of memory.

Object: Machine instructions, as distinct from the source code from which it was generated.

Reentrant: Code which can be used by several users at once, keeping separate variables for each.

Relocatable: Code which can be loaded and run anywhere in the computer's memory.

Source code: A program written in assembler, or a high level language such as BASIC, which must then be assembled or compiled to produce the object code which can actually be executed.

Cold Boot: To start up a system from scratch, loading the operating system from disk or tape.

Cold Start: See Cold Boot.

COM file: In CP/M parlance a command file, that is, a machine code program that can actually be run.

Command: An instruction from the console for the system to do something.

Comment: A note added into a program to help the reader (or programmer) to understand its operation. Does not affect the program's execution in any way.

Compiler: A program which accepts as input a source file written in a high level language, and produces as output an object file containing the machine instructions which are actually executed.

Computer: Are you serious?

Concatenate: To join two strings together, one after the other.

Conditional: A test; for example, is X greater than Y: IF X is greater than Y

THEN GOSUB 500 (BASIC)

or, if the carry flag is set, jump to location NEXDIG:

JC NEXDIG (Assembler)

Conditionals are one of the most powerful features of any computer language.

Console: The keyboard and screen from which the operator controls the computer.

Control characters: Codes which perform functions like acknowledging correct receipt of a message or requesting retransmission of an erroneous message. Control characters are defined as part of the ASCII and similar codes.

Copy: To duplicate, usually for backup safety.

CP/M: A disk operating system for 8080 and Z80 based microcomputers. Allows the user to store information and programs in named files, as well as managing disk storage and input/output functions. Other disk operating systems include TRSDOS (on TRS-80) and DOS 3.3 (for Apple).

CRT: Cathode Ray Tube. Usually refers to the screen of a video terminal or the terminal itself.

Data: Information to be processed by, or output from, a program.

DDT: Dynamic Debug Tool. A program that assists the user to find errors in machine code programs.

Debug: To locate and fix errors.

Decimal: Based on ten.

Delete: To erase.

Device: A piece of equipment such as a printer or tape drive which the computer uses.

Directory: A list of the programs on a disk (or occasionally tape) together with necessary information, such as length and location.

Disc: A flat, circular magnetic surface on which the computer can store and retrieve data and programs. Is fast compared with tape, particularly when access is not one item after another.

Disk drive: The mechanical assembly which rotates the disk and positions the read/-write head.

Disk Operating System: A program which operates one or more disk drives automatically and mangages the system.

Display: The computer's output device at the console, usually a TV-like display of letters and numbers; sometimes the computer can draw on the display.

Double Density: A method of recording twice as much information on a floppy disk.

Dump: To list out the contents of memory or a disk.

Echo: When the computer inputs a character from the keyboard, it then sends it back to the display so that you can see it was received correctly.

ED: An editor program; part of CP/M.

Editor: A program which lets you alter and correct source files and other documents.

Erase: See delete.

Error Message: Tells you something went wrong, and sometimes what.

Execute: To run a program; to follow its instructions.

FIFO: First in, first out.

File: A continuous collection of characters (or bytes) saved on a disk or tape for later reloading.

Fixed Point: Counting in integers only. Usually limited to small values, and restricted in accuracy, giving rise to ridiculous answers such as 9/5 = 1.

Flag: A variable, sometimes a single bit, which can have only two values, used to indicate some condition.

Floating point: The kind of arithmetic used in scientific calculators.

Floppy disk: A disk, made of thin flexible mylar, and enclosed in a card jacket, which can be used for magnetic storage. There are two varieties; eight inch and 5¼ inch. These can typically store somewhere between 140,000 and 3 million bytes (characters).

Focal: Formula Calculator. A simple language, rather like a small BASIC, found on some mini and microcomputers.

FORTRAN: Formula Translation. One of the first computer languages, and beginning to show it.

Function: A sub-progam that processes variables in some well-defined way.

Garbage Collection: The process of going through memory or disk space, reclaiming all the unused space.

Global: A variable which is known to all the parts of a program. See local.

Grammar: The formal rules of a language.

Hard Disk: A disk made of hard material, larger, faster and more fragile than a floppy disk, and capable of storing 70 million bytes or more.

Hard Copy: Printout.

Hardware: The bits of a computer you can kick, as opposed to the programs you can only swear at.

Hashing: A method of reducing the size of a table which otherwise would have mostly empty entries.

Hexadecimal: The method of counting to the base sixteen. Or the method of splitting binary digits into groups of four, which is the same thing. In hex, you count: 0 1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22. .

Identifier: A label, or the name of a variable.

Iff: If and only if.

Index: A variable which usually points to an entry in a table or list.

Index Register: A processor register which is used to access tables and lists in memory.

Indirect Addressing: Referring to a variable which actually contains the address of another variable.

Input: To get data into the computer.

Instruction: A step the computer can perform.

Integer: A whole number.

Intermediate Code: A special kind of object code which cannot be run directly on the computer, but must be interpreted.

Interpreter: A program which examines source code a line at a time, decides what it means, and then does it. Compare with compiler.

Interrupt: To electronically drag the computer away from what it is doing in order to respond to some time-critical situation.

I/O: Input/Output.

Jump Instruction: Normally, control proceeds from one instruction to the next, one after the other. A jump instruction passes control, not to the following instruction, but to some other. Jumps can be conditional.

Kilo-: Prefix meaning one thousand.

Kilobyte: 1024 bytes (Kbyte).

Kilobaud: 1000 baud (kbaud).

Label: A word which identifies the destination of a call or jump instruction, or simply identifies some location in memory.

Language: The set of instructions, and rules for stringing them together, which you use to instruct the computer what to do.

Library: A set of programs, or sub-progams.

Line Number: A number at the beginning of a line, which identifies it in a similar way to a label.

Line Printer: A high-speed printer for computer output.

Link: Part of a data item in a list, which tells the computer the location of the next data item.

LISP: A list processing language, much favoured by the artificial intelligence community.

List: A sequence of consecutive data items.

Load: To transfer some data or program into the computer memory.

Locate: To "fix" a relocatable code so that it will only run if loaded in a particular location.

Logical Device: A device as the computer "sees" it: what the computer regards as the "list device" may be one of several "physical devices", such as a line printer or teletype.

Loop: To repeatedly execute a sequence of instructions; part of a computer program that is so executed.

Machine Language: The binary codes the machine actually executes.

Macro: A user-defined sequence of instructions which can be inserted anywhere in a program.

Macroassembler: An assembler which can utilise macros.

MBASIC: Microsoft BASIC; the BASIC used in the TRS-80, PET, Apple 11 and so on.

Memory: Where the computer stores data and programs internally for fast acccess.

Menu: A display which offers the operator a choice of several alternatives.

Microcomputer: A small computer based on a microprocessor.

glossary

Microprocessor: The central processing unit of a computer, built into a single silicon chip.
Mini-diskette: A 5¼ inch floppy disk.
MP/M: A multi-user version of CP/M.
NAD: A name and address file maintenance program.
Numerical analysis: The art and science of number crunching.
Object Code: Machine code.
Object File: A file containing object code.
Object Module: An object file containing part of a program, ready to be linked to others.
Octal: the system of counting to base eight, or grouping bits in threes.
Offset: To load an object file somewhere it will not run, in order to edit or modify it.
Open: To give the operating system the characteristics of a file so that it can subsequently read or write it.
Operand: The number an operator (+, −, etc) operates on.
all work. See Disk Operating System.
Operator: An arithmetic function or some other function which alters variables.
Optimization: Making a program work better (or faster, or using less memory).
Output: What the systems produces.
Packed Data: Data which shares the same address, and has to be unpacked before use.
Page: A length of memory, typically 256 bytes.
Parameter: A constant which sometimes has to be varied.
Parity: An extra bit on the end of a character or byte for error detection.
Pascal: A modern structured language which may eventually rival BASIC in popularity.
Password: A secret word the system may demand of you before allowing you access to certain (or all) programs or data.
Patch: A temporary (ha,ha) fix on a bug.
Peripheral: A piece of equipment the computer uses, like a printer, disk drive, or modem.
Peripheral Driver: A program which outputs data to a peripheral and controls it.
Physical Device: See Logical Device.
PIP: Peripheral Interchange Program. A CP/M utility for copying files between devices.
PL.1: Programming Language /1. A good general purpose commercial language.
Pointer: A variable used for indirect addressing.
Polish Notation: A method of separating operators and operands; e.g. + 5 4 is Polish Notation for 4 + 5.
Poll: To ask a peripheral if it requires service.
Postfix Notation: Also known as Reverse Polish Notation, this is similar to Polish; 4 5 means 4 + 5.
Preprocessor: A program which does part of a job to make life easier for the program which follows; e.g. a macro processor before an assembler.
Printer: Gets computer output down onto paper.
Priority: The resolution of which interrupt is serviced first if two should arrive at the same time.
Process: A program.
Program: A sequence of instructions which can be understood, and ultimately followed, by a computer.
Prompt: A message asking the operator to supply information.
Queue: A list in which entries are made at one end, and removed from the other.
R/O: Read Only; cannot be overwritten.
RAM: Random Access Memory.
Random Access Memory: The computer's internal memory which is used to hold running programs and data. The computer can both write and read RAM.
Read Only Memory: Memory used to store programs, which can not be erased or overwritten.
Reader: Paper tape input device.
Read/Write Head: The small coil which reads and writes on the surface of a disk.
Reconfigure: To reorganise the I/O or other aspects of a system.
Record: A set of related data items. For example, an employee's name, address, payroll number and pay rate would form a record.
Recursion: The ability of functions in some languages to call themselves.
Redundant: Not needed or taken for granted.
Reentrant Code: Code which can be used by several programs simultaneously, keeping separate data for each.
Register: A location in the processor capable of performing logical or arithmetic functions on the contents.
Relocatable: Capable of being moved in memory.
Relocatable Object Module: Part of a larger program consisting of many such modules, all linked together and located.
Resident: Permanently in the system.
Reverse Polish Notation: See Postfix.
RPN: See Reverse Polish Notation.
Run: To execute a program.
Save: To store a program on disk or cassette (particularly BASIC).
Schedule: To decide at what stage a process should run (of an operating system).
Screen: See CRT.
Sector: A section of data on a disk.
Simulation: Making one system behave like another.
Software: Programs.
Source Code: The original text form of a program.
Source File: A file of source code.
Source Language: The language the source code is written in, e.g. BASIC, Assembler, C.
Sort: To arrange items of data in order.
Spool: To output a file to a peripheral, usually either a printer or tape.
Stack: A list in which both entries and removals are made at the same end. A microprocessor usually has a hardware stack which is used to save subroutine return addresses, temporary storage of data, and to pass variables between subroutines.
String: A sequence of characters.
Submit: To put the system under control of a file of system commands.
Subroutine: Part of a program which can be accessed from several points within the program.
Symbol: The name of a variable or a location in memory.
Symbol Table: A table constructed by an assembler or compiler to give the addresses of all variables and labels in a program.
Symbolic Name: A label.
System: A collection of hardware and software, possessed of the property that the whole is greater than the sum of the parts.
System disk: A disk carrying the operating system.
Teletype: An electromechanical printer/-keyboard.
Timeshare: Running several programs on a system simultaneously.
Track: The area under the read/write head during one rotation of a disk.
Transfer: To move data.
Transient: A program that is only in memory for a short time before being overwritten. Often, the only program that is not a transient is the operating system.
Tree: A list in which each data item may refer to several others.
TTY: See Teletype.
Unix: A multi-user, multi-tasking, multi-programming operating system, expected to appear on microcomputers before long.
User: One of the people connected to the computer.
Utility: A program of use to most users.
Variable: Named quantity that can take on different values.
Verify: To check that data written on a disk or tape can be read again correctly.
Warm boot: To reload the operating system a second or subsequent time.
Word: The amount of data fetched from one memory location. Typically one byte, but can be two on recent processors.
Word Processor: A system for manipulating, editing, printing and formatting texts files.
WordStar: A proprietary word processing program.
Write Protect: To remove the cover from the notch in a floppy disk so that it cannot be written on.
Zilog: Manufacturer of the Z-80 and Z8000 microprocessors.
Z80: A popular 8-bit microprocessor.

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All Contributions: should include your name, address, and home and office phone numbers (in case we need to check details).

Contributions on disk: Contributions can be accepted on 20 cm standard CP/M disks or on 13 cm Apple DOS or Apple CP/M disks. Please pack them extremely carefully if posting, and label all disks with your name, address and phone number.

Style: All items should be typed (or printed) and double-spaced on white paper. Include your name, address, telephone number and the date on the first page of your manuscript (all manuscript pages should have your surname and page number in the top right-hand corner). Be clear and concise, and keep jargon and adjectives to a minimum.

Listings: Unless it is absolutely impossible, we want listings produced on the computer. This reduces the risk of error — if the computer typed it, the computer probably accepted it. Print listings with a dark ribbon on white paper. If they can't be produced on a printer, borrow a typewriter — hand-written material is likely to sit around the office for a year before someone can find time to type it all out for you! Please provide an account of what the program does, how it works and so on. Any comments on the program should refer to the address, line number or label rather than to a page number. Any comments on modifying the program to work on other machines will be appreciated. Try to include a printout of at least part of a sample run if possible.

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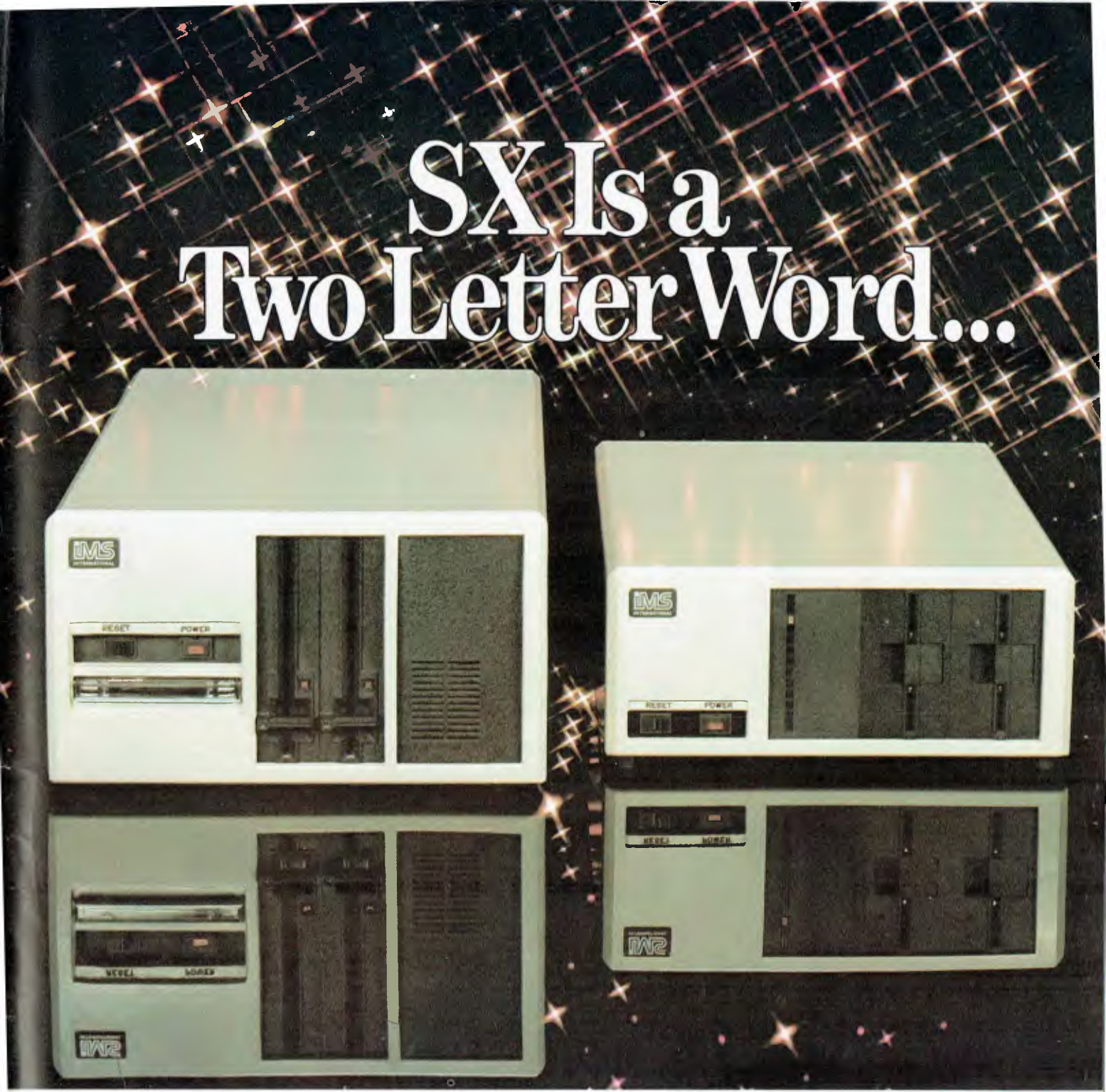

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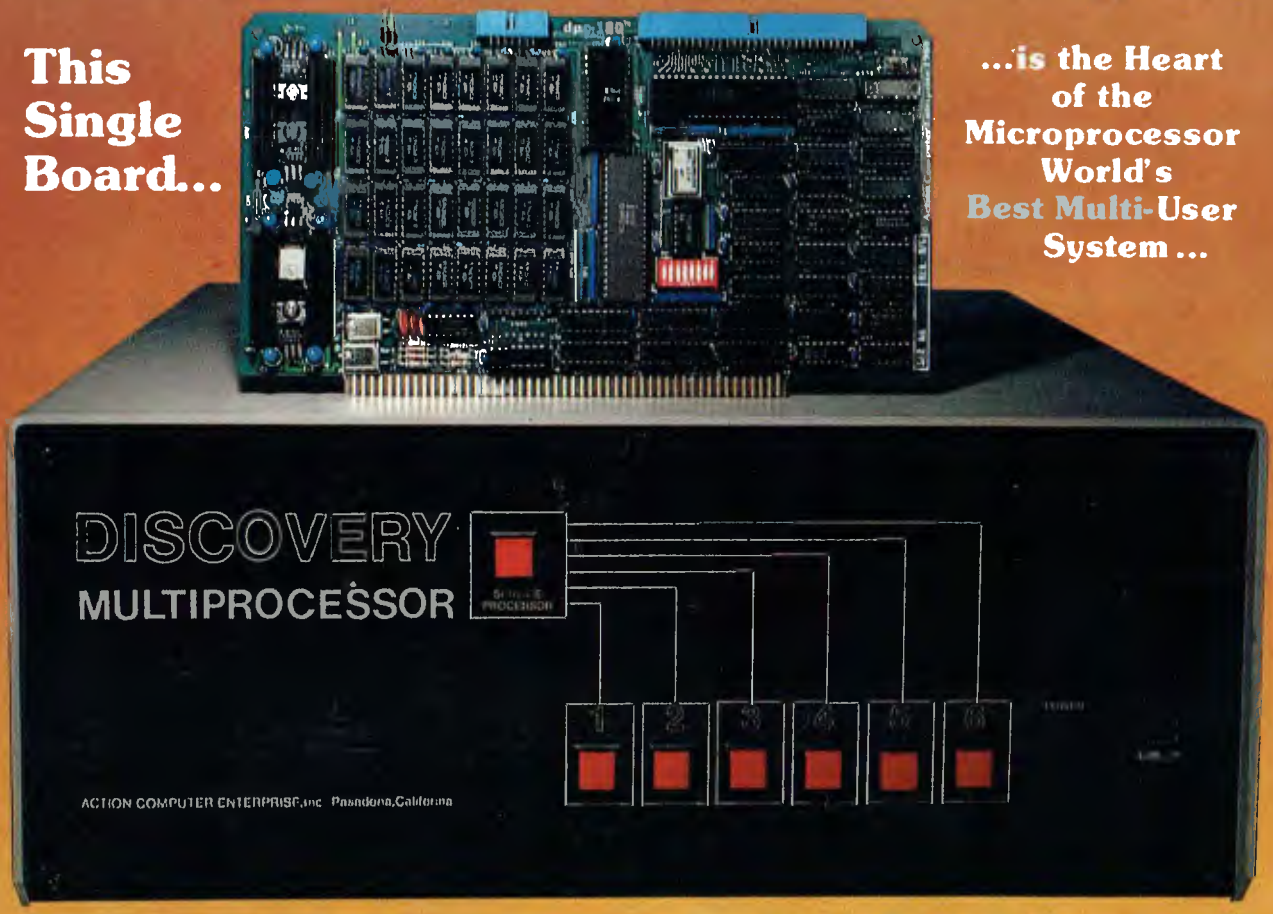

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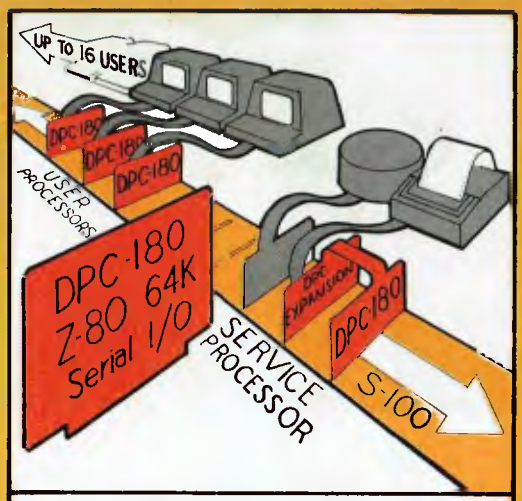

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